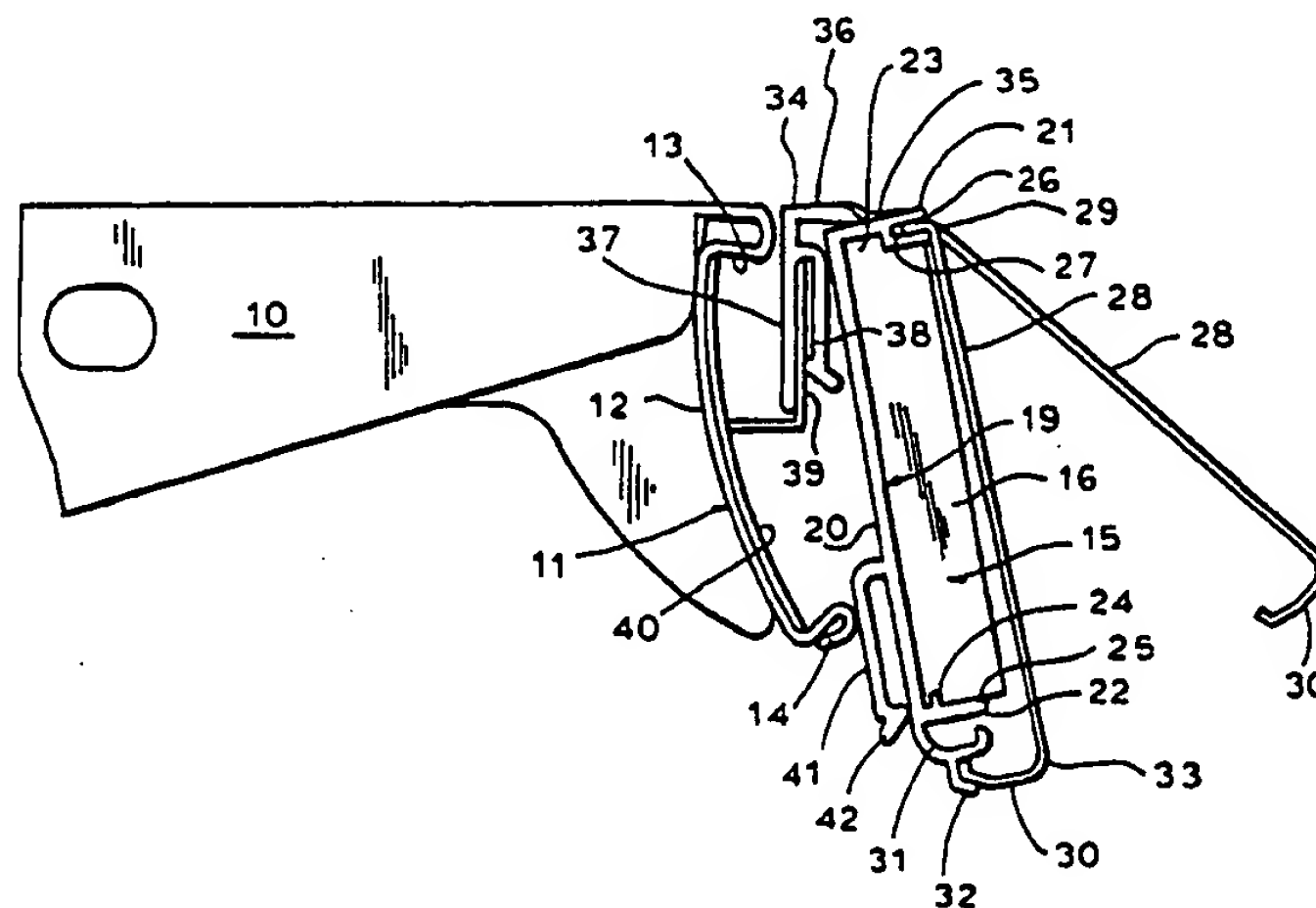




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(54) Title: DEVICES FOR MOUNTING AND DISPLAY OF ELECTRONIC LABELS AND THE LIKE



(57) Abstract

A label holder and mounting clip for the mounting and display of electronic labels (15). A label holder (19) of extruded plastic material snugly receives the enclosure of the electronic label which can be protected by a clear cover (28) extending over the front of the label holder. A mounting strip is co-extruded with the label holder (19) and is flexibly attached thereto by a co-extruded living hinge (35). Mounting brackets (40) are received in pricing channels (11) along the front of display shelving (10) and include a forwardly display, upwardly extending mounting tongue (39) received in a downwardly opening slot (38) in the mounting strip (34). The angle of display of the label may be controlled by inserting an angle bracket (43) into the downwardly opening slot, alongside the tongue of the mounting clip, oriented so that one leg (45, 44) of the angle bracket extends forward and supports the back of the label holder in an upwardly angled position for a better viewing angle.

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DEVICES FOR MOUNTING AND DISPLAY OF ELECTRONIC
LABELS AND THE LIKE

Background and Summary of the Invention

The invention relates to the display of product and
5 pricing information in connection with product display in
supermarkets and the like.

In supermarkets, mass merchandising outlets and other
retail stores, it is common practice to display merchandise
on organized shelving. The shelving typically carries a
10 pricing channel at the outer edge of each of the shelves
for displaying specific pricing and product information
relating to the adjacent product display. Typically, such
pricing channels comprise an elongated member of generally
concave configuration, having retaining flanges extending
15 along upper and lower edges. Flexible pricing tags, of
paper or plastic material and containing pricing, product
information and typically bar code identification, can be
easily installed in and removed from the pricing channels
to maintain product pricing and information on a relatively
20 up-to-date basis.

Currently, there is a desire on the part of many
supermarkets and mass merchandisers in particular to
substitute so-called "electronic labels" for conventional
printed labels formed of flexible paper or plastic. The
25 electronic labels are self-contained electronic devices
(powered by batteries, solar panels or other means)
including a display window with a liquid crystal display or
the like for presenting the desired product and pricing
information, bar coding and the like. An individual
30 electronic label is provided for each product
classification, in the same manner as conventional printed
labels. A particularly desirable and advantageous feature
of the electronic labels is the ability to control and

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change them remotely from a central computer via wireless communication. This enables rapid, remote controlled repricing of products as frequently as desired. For example, a store may easily re-price many of its products
5 in accordance with observed traffic flow patterns during the course of a typical day, as by having special sales during a one or two hour period when traffic is customarily low, in order to encourage a greater uniformity of daily traffic patterns. Such short term repricing is essentially
10 impossible to conduct on a large scale with conventional manual pricing techniques.

Along with the many advantages of electronic labels, come certain problems that must be solved and accommodated. As will be appreciated, an electronic label is in the
15 nature of a calculator or small computer, and is many times larger, bulkier and heavier than a conventional label. They are thus considerably more difficult to mount along the front edges of the display shelves. Electronic labels are also quite costly and thus need to be protected against
20 damage from contact with shopping carts, for example. Additionally, the liquid crystal or other electronic displays of the electronic labels can be difficult to read if viewed at a substantial angle to the face of the display window. Accordingly, it is important to mount the
25 electronic label so that it tends to be relatively square to the viewing direction of the shopper. Thus, labels at or near normal eye level can be relatively vertically oriented, whereas those mounted on lower shelves optimally are disposed at an angle facing upwardly toward the viewer,
30 with the optimal angle to the vertical being greater at progressively lower shelf levels.

In accordance with the invention, a new and improved arrangement is provided for housing and mounting of

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electronic labels at the front edges of product display shelving, enabling the electronic labels to be easily but ruggedly mounted, well protected and adjustably positioned. The devices of the invention enable electronic labels to be
5 utilized in an entirely practical and effective way in conjunction with display shelving of existing design and construction, such that the installation of electronic labels does not require extensive rebuilding of the display fixtures.

10 One aspect of the invention is directed to the provision of a novel and improved holder for an electronic label. The label holder, preferably formed by extrusion processes, comprises a back wall and upper and lower, forwardly extending flange walls for receiving and tightly
15 gripping the upper and lower edges of an electronic label device. The label holder incorporates a continuous mounting strip, which extends along the full length of the label holder back wall and is connected to an upper portion of the holder by means of a co-extruded flexible living
20 hinge section, enabling the mounting strip to be disposed at a variety of angles with respect to the back wall of the label holder. A transparent cover, also of extruded or co-extruded plastic material, is closed over the front of the label holder to enclose and protect an electronic label
25 installed within the main holder section.

The attached, hingable mounting strip is provided with a continuous, downwardly opening slot which serves dual functions: It enables the mounting strip to be mounted upon an upwardly extending support element, by
30 which the label holder and the contained electronic label can be mounted firmly in a pricing channel. The slot also provides for the reception of a removable angle bracket by which the hinge angle between the mounting strip and the

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back wall of the holder may be varied, in order to present the electronic label at a desired viewing angle.

The present invention is also directed to a variety of mounting clips or brackets which are readily and
5 securely installed in pricing channels of various sizes and configurations, to accommodate easy and secure mounting of the above mentioned label holders and the electronic labels contained therein. In this respect, conventional pricing channels come in a variety of sizes and shapes, and the
10 invention contemplates the provision of a variety of mounting clips of novel design and construction to accommodate the conventional variety of channel sizes and shapes. In one preferred form of the invention, the mounting clip is constructed in two pieces slidably related
15 to each other. At least one and preferably both pieces are provided with an inclined surface, such that lateral adjustment of one part of the clip relative to the other changes the overall height of the clip so that it can be tightly fitted in a variety of pricing channels.

20 In another preferred form of the invention, a one-piece clip is designed to be installed in the pricing channel in either of two reversible orientations to accommodate a wide range of channel dimensions.

In yet other preferred embodiments of the invention,
25 intended for use in conjunction with metal shelving provided on the top with regularly spaced through openings, novel mounting clips are provided with lugs or tabs arranged to be received in such openings and with a clamping portion arranged to grip the bottom portions of
30 the shelving.

In any of its forms, the invention serves to

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accommodate in a highly practical, economical and effective way the mounting and display of electronic labels in connection with existing, conventional display shelving.

For a more complete understanding of the above and
5 other features and advantages of the invention, reference should be made to the following detailed description of a preferred embodiment of the invention and to the accompanying drawings.

Description of the Drawings

10 Fig. 1 is a side elevational representation of a housing according to the invention for mounting of an electronic label at the front of display shelving, with a cover shown in open and closed positions.

Fig. 2 is a view similar to Fig. 1, showing the
15 housing and electronic label supported in a first viewing angle.

Fig. 3 is a view similar to Fig. 2, with the housing and electronic label shown disposed at a greater viewing angle.

20 Figs. 4 and 5 are front and side elevational views respectively of an angle bracket, employed in the arrangements of Figs. 2 and 3 for supporting the housing and label at a desired viewing angle.

Fig. 6 is a front elevational view of the housing and
25 .electronic label of Fig. 1.

Fig. 7 is a rear perspective view of a preferred form of electronic label housing according to the invention, illustrating the housing in association with an

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advantageous form of mounting clip and in association with an angle bracket.

Fig. 8 is an exploded view of the mounting clip of Fig. 7.

5 Figs. 9 and 10 are front elevational views of the mounting clip of Fig. 8, illustrating the bracket in adjusted positions for relatively narrow and relatively wide pricing channels respectively.

10 Fig. 11 is a front elevational view of a one-piece reversible form of clip for mounting of a housing and electronic label in a conventional pricing channel.

15 Figs. 12 and 13 are side elevational views of the mounting clip of Fig. 11, shown in reverse orientations for installation in relatively wider and relatively narrower sizes of pricing channels.

 Figs. 14 and 15 are front and side elevations respectively of a further modified form of mounting clip.

20 Fig. 16 is a front elevational view of a form of mounting clip useful in connection with metal shelving provided with regularly spaced openings in the surface thereof.

 Fig. 17 is a side elevational view of the clip of Fig. 16, shown mounted on one form of metal shelving, and mounting a label housing.

25 Fig. 18 is a side elevational view of the clip of Fig. 16, shown installed on a second style of metal shelving.

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Fig. 19 is a side elevational view of a modified form of plastic housing for receiving and mounting of a second form of electronic label device.

Description of Preferred Embodiments

5 Referring now to the drawings and initially to Fig. 1, the reference numeral 10 designates a section of display shelving mounting a pricing channel 11 along its front edge. The pricing channel 11, which is generally representative of a wide variety of such channels, includes
10 a central body 12 of concave contours, and upper and lower, forwardly projecting retaining flanges 13, 14. The retaining flanges typically are angled slightly inward, toward each other to define an acute angle with adjacent portions of the concave central section 12. The
15 configuration is designed to receive and retain plastic or paper labels containing pricing and product information related to products (not shown) displayed on the shelving 10.

The devices of the present invention are intended to
20 accommodate the mounting at the front of the display shelf 10 of electronic label devices 15, instead of the typical conventional paper or plastic labels. The electronic label devices 15, which form no part of the present invention, are self-contained, battery-operated electronic devices
25 which include a housing or enclosure 16 (see Fig. 6) and one or more display windows 17, 18. The display windows may be liquid crystal displays, for example, programmed to display all of the relevant information for a given product, including pricing, product description, bar coding
30 and other information. The electronic labels are remotely programmable via wireless communication to enable easy, rapid resetting of the labels for special sales, general

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repricing, etc.

Inasmuch as the electronic labels 15 are relatively expensive, and somewhat delicate, it is necessary to mount and display the labels in a secure, reliable and safe manner. In addition, the display windows of the label holder can be difficult to read at acute viewing angles, and it is thus necessary, or at least very desirable, to provide for the mounting of the labels at various viewing angles which are convenient to the purchaser.

10 Pursuant to the present invention, the electronic label 15 is mounted by means of a label holder 19, formed of a relatively rigid plastic material, such as rigid polyvinyl chloride, preferably by continuous extrusion processes to provide a uniform cross section throughout.

15 The label holder 19 is provided with a back wall 20 and upper and lower forwardly extending retaining flange walls 21, 22. The spacing and configuration of the flange walls 21, 22 is arranged to conform as necessary to the upper and lower edge contours of the label enclosure 16 (which may

20 vary from manufacturer to manufacturer). In the illustrated arrangement, the label enclosure 16 is formed with a rib 23 extending along the upper edge, and the upper flange wall 21 of the label holder is configured to lockingly receive that rib. The lower flange wall 22 of

25 the support housing is provided with a small inwardly projecting rib 24 arranged to have frictional engagement with the lower edge surface 25 of the label enclosure such that, when the electronic label 15 is pressed into the label holder 19, it is tightly secured therein and can be

30 removed only with intentional force.

In the form of the invention illustrated in Fig. 1, the upper flange wall 21 of the support housing is provided

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with an outwardly opening slot 26 for the snug reception of an upper edge margin 27 of a clear cover element 28. The cover element desirably is extruded of clear, relatively rigid plastic material, with a co-extruded portion 29
5 formed of softer plastic material to provide a hinge along the upper edge margin. The lower edge portion of the cover 28 is shaped with an inwardly extending flange 30 which frictionally engages with a closure flange 31 provided along the lower edge of the label holder. Desirably, the
10 inwardly extending portion 30 of the cover, in the closed position, seats against an abutment rib 32.

In Fig. 1, in which the cover 28 is shown in both open and closed positions, it will be observed that, in the closed position, the lower front corner portion 33 of the
15 cover is positioned well below and somewhat forwardly of the lower portion of the electronic label enclosure 16, and also that the front panel of the cover, when the cover is seated against the abutment rib 32, is spaced slightly in front of the label enclosure 16. This provides for a
20 measure of protection of the electronic label against being bumped into by shopping carts or the like.

The label holder 19 may be of any suitable length, and may in fact run the full length of the shelving if desired. Since the label holder is of extruded
25 construction, cutting it to any suitable length is a simple production operation. In many cases, however, it is advantageous to provide the support housing in lengths just slightly longer than the length of the label enclosure 16, as shown in Fig. 6.

30 Mounted at the back of the label holder 19 is a mounting strip 34 of extruded construction. The mounting strip 34 is permanently and flexibly secured to an upper

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portion of the label holder 19, preferably at the flange wall 21, by a co-extruded living hinge section 35 of relatively soft plastic material, such as soft polyvinyl chloride. The rest of the mounting strip 34 is preferably
5 extruded of a relatively rigid polyvinyl chloride material.

As shown in the drawings, the mounting strip 34 includes a rearwardly extending portion 36 and a downwardly extending portion 37 defining a downwardly opening slot 38. The slot 38 is adapted to receive an upwardly extending
10 mounting tongue 39 of a metal mounting clip 40 to be further described. The mounting clip 40, which may be of a variety of styles as will be described hereinafter, is securely received within the pricing channel and retained therein by the opposed flanges 13, 14. The mounting tongue
15 39 is integral with the body of the clip and is positioned forwardly thereof. Typically and desirably, the mounting tongue 39 can be relatively narrow in width in relation to the overall length of the label support housing 19. For example, a single mounting clip 40, having a tongue 39 of
20 less than one inch in width, may be utilized to mount a label housing 19 of six inches or so in length. Where necessary or desirable for relatively long housings, more than one clip may be employed. Since the mounting strip 34 is part of the continuous extrusion of the label housing,
25 it extends for the full length thereof and can receive the tongue of one or more mounting clips at any one or more points along the length.

Pursuant to the invention, the co-extruded living hinge 35 joining the mounting strip 34 with the main body
30 of the label holder 19 provides for relatively free swinging movement of the label holder relative to the mounting strip 34, which is fixed to the mounting tongue 39.

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Adjacent the lower portion of the back wall 20 of the label holder is an integral clip 41 which extends downward along the lower portion of the back wall 20 and has an inwardly projecting, V-shaped flange 42 at its lower end which presses resiliently against the back wall 20. The clip 41, being part of the overall extrusion of the label holder 19, extends for the full length thereof along the bottom and advantageously can be utilized to receive temporary slips and cards, for example, for special announcements or the like. Additionally, the clip 41, shown in Fig. 1 to be supported against the lower flange 14 of the pricing strip, can provide a measure of resilient cushioning in the event the holder is bumped into.

With reference to Figs. 2 and 3, the label holder 19 is shown supported at different viewing angles, which may be desirable for the mounting of electronic labels on the lower shelves of a display, to facilitate a more direct viewing angle for the customer. For this purpose, an angle bracket 43 (Figs. 4 and 5) is provided. The angle bracket desirably is in the form of a continuous extrusion of uniform cross section, of generally L-shaped configuration, having a relatively longer leg 44 and a relatively shorter leg 45. The angle bracket may be cut to a suitable length, for example three inches, and one of the legs thereof inserted into the downwardly opening slot 38 of the label holder mounting strip 34, as shown in Figs. 2 and 3. In this respect, the angle bracket is received in the slot 38 with the mounting tongue 39, but at a position laterally displaced therefrom (see Fig. 7).

When the longer leg 44 of the angle bracket is inserted in the slot 38, the shorter leg 45 extends forwardly and engages the back wall 20 of the label holder

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to support the label holder at a somewhat greater upward tilt than is reflected in Fig. 1, for example. To increase the angle of upward tilt, as shown in Fig. 3, the angle bracket 43 is reversed such that the shorter leg 45 thereof is inserted into the slot 38, with the longer leg 44 extending forwardly into contact with the back wall 20 of the label holder. Desirably, the respective legs 44, 45 of the angle bracket may be provided with longitudinally extending retaining ribs 46, which engage with a V-shaped flange 47 located at the lower end of the slot 38 to act as a retaining detent for the angle bracket.

As will be appreciated, when the label and label holder are extended outwardly at increased viewing angles, as reflected in Figs. 2 and 3, there is somewhat greater vulnerability to bumping off the label holder. To this end, the angle bracket 43 is formed of a suitable plastic material, such as rigid polyvinyl chloride, which has considerable resilience for absorbing accidental bumps.

Figs. 7-10 illustrate a particularly advantageous forms of mounting clip which can be utilized for mounting of the label holder and electronic label in the manner shown in Figs. 1-3. The mounting clip of Figs. 7-10 is designed to accommodate many of the wide variety of widths of pricing channels which are regularly encountered in connection with the installed base of display shelving. The form of mounting clip shown in Figs. 7-10 comprises upper and lower sections 50, 51. Preferably, at least the upper section 50 is formed of spring sheet metal, and the lower section 51 may advantageously be formed of plastic. However, in appropriate cases, either or both parts may be made of plastic or metal materials.

In the illustrated arrangement, the sheet metal upper

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part 50 is shaped to provide spaced-apart, upwardly extending arms 52 arranged to extend into the upper groove of a pricing channel. Located between the upwardly extending arms 52 is an offset, upwardly extending mounting tongue 53. The tongue 53 preferably is integral with the main body of the upper clip portion 50, being offset therefrom by an integral, outwardly extending section 54. The lower edge 55 is disposed at a slight angle of incline, as shown particularly in Figs. 9 and 10. The bottom edge 55 preferably is formed with small teeth or serrations, not specifically illustrated.

The lower portion 51 of the mounting clip, preferably formed of plastic for convenience, is provided with an upwardly opening slot 56 arranged to receive and frictionally grip the lower edge margins of the upper clip portion 50. The slot 56 is formed with an inclined bottom 57 complimentary to the inclined bottom edge 55 of the upper part 50. As is reflected in Figs. 9 and 10, the overall height of the assembled clip 50, 51 can be varied considerably by lateral displacement of the respective parts 50, 51 with respect to each other to enable the mounting clip to be securely positioned within the upper and lower flanges 13, 14 of pricing channels 11 of different channel heights. The provision of serrations or the like (not shown) on one or both of the surfaces 55, 57 assures that the parts 50, 51, once laterally adjusted to a snug fit in a pricing channel, will remain in the adjusted relationship.

Desirably, the mounting tongue 53 is provided with a punched-out locking tab 58, the free end of which projects outward from the plane of the mounting tongue and extends in a downward direction to resist removal of the label holder, once the label holder is installed on the mounting

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tongue.

The mounting of the label holder on a forwardly offset tongue of the mounting clip (see representative illustrations in Figs. 1-3) provides for a desirable degree of resilience in the mounting of the label holder to help resist damage from bumps and shocks that might be administered in the normal course of events.

Referring now to Figs. 11-13 of the drawings, there is shown an alternative preferred form of mounting clip which is designed and constructed to be reversibly positioned within a pricing channel in order to accommodate channels of different height. The reversible clip, generally identified by the reference numeral 60, advantageously is formed of a suitable spring steel material and includes upper and lower body portions 61, 62 joined at a slight angle along an intermediate line 63. The upper body portion has spaced apart, upwardly extending arms 64, and the lower body portion 62 is provided with spaced apart downwardly extending legs 65. Between the upwardly extending arms is an upwardly extending mounting tongue 66 joined integrally with the upper body portion 61 by an offset section 67.

Pursuant to the invention, the configuration of the mounting clip 60 is such that the distance from the upper edges of the mounting tongue 66 to the lower edges of the downwardly extending legs 65 is different than (typically less) the difference between the upper extremities of the arms 64 and the lower extremities of the legs 65.

In a "normal" orientation of the clip 60 of Figs. 11-13, the clip can be installed in a price channel 68, in the manner shown in Fig. 12, with the arms 64 and legs 65

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engaging upper and lower flanges 69, 70 respectively of the price channel. The mounting tongue 66 extends outward and upward in front of the price channel, for mounting of the label holder in a manner previously described.

5 For a price channel of somewhat narrower dimensions than shown in Fig. 12, for example a channel of the dimensions shown in Fig. 13, the mounting clip can be reversely oriented such that the downwardly extending legs 65 are received at the lower flange 71 of a price channel
10 72 and the mounting tongue 66 is inserted against the upper flange 73 of the price channel. The two upwardly extending arms 64 are then positioned in a generally vertical orientation in front of the price channel, in the manner shown in Fig. 13. The label holder is then mounted on the
15 upwardly extending arm portions 64 of the mounting clip, which perform the functions of the tongue 66 in the previously described example.

In the mounting clip device of Figs. 11-13, both the mounting tongue 66 and the upwardly extending arms 64 are
20 provided with punched-out tabs 74, 75, projecting generally downward but in opposite ways for engagement within the downwardly opening slot 38 of the label holder to inhibit removal of the label holder once joined with the mounting clip.

25 Figs. 14 and 15 illustrate a modified form of the reversible clip shown in Figs. 11-13, in which the main body 76 of the clip is of generally arcuate contours, provided with spaced apart upwardly extending arms 77 and downwardly projecting legs 78 as well as an offset,
30 upwardly extending mounting tongue 79. To accommodate reversible application, each of the arms 77 is provided with a punched-out tab 80, and the mounting tongue is

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provided with a similar tab 81 extending in an opposite direction. The manner of mounting and utilization of the clip of Figs. 14, 15 is generally the same as that of the clip of Figs. 11-13.

5 Figs. 16-18 illustrate an alternative preferred form of mounting clip adapted particularly for shelving of a type containing regularly spaced openings in the display surface of the shelving. The clip 90 (Fig. 16) advantageously may be formed of spring steel strip or other
10 suitable material and includes a body portion 91 which is bent inwardly at the bottom to form a clamping section 92 and guide flange 93. An upper portion 94 of the mounting clip is bent rearwardly from the body 91 to extend in flat relation over the top surface 95 of a display shelf, in the
15 manner illustrated in Fig. 17. At its end, the upper portion 94 is provided with spaced apart, downwardly extending retaining tabs 96 which are arranged to be received in and project through openings 97 in the surface of the shelving. The retaining tabs 96 are spaced apart to
20 correspond with the center-to-center spacing of a pair of openings provided in the shelving, and the width of the tabs is such as to enable them to be freely received in such openings.

In the shelving arrangement of Fig. 17, the clip 90
25 is mounted by first inserting its tabs 96 through an appropriate pair of openings 97 in the shelving. The inherent resilience and flexibility of the spring material of the clip enables the lower portion to be displaced outwardly of the shelving during this initial step of the
30 installation. Once the tabs are positioned in the proper openings, the lower portion of the clip can be pushed rearwardly until the guide flange 93 clears the lower edge 98 of the pricing channel 99, which locks the mounting clip

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in position.

The mounting clip 90 includes a stamped-out, forwardly offset and upwardly extending mounting tongue 100, which is integrally attached to the body by a forward
5 offset 101 and is arranged to be received within the downwardly opening slot 38 of a label holder 19, in a manner previously described, such that the label and label holder are securely mounted at the front of the shelving.

In the illustration of Fig. 17, the label housing is
10 more or less vertically oriented. In order to provide upwardly tilted viewing angles, an angle bracket of the type shown in Figs. 4 and 5 can be employed, in the manner heretofore described.

Fig. 18 illustrates the mounting clip 90 of Fig. 16
15 installed at the front of a display shelf having a slanted front surface 102, but no price channel of the conventional type. The installation of the clip 90 to such a shelf is similar to that described in connection with Fig. 17, in that the retaining tabs 96 are initially installed in a
20 pair of spaced openings in the shelf upper surface. The selection of openings is such that the front body 91 of the mounting clip is resiliently displaced to a larger than normal angle at the juncture 103 with the upper portion 94. Accordingly, the resilient action of the spring material
25 tends to press the lower clamping portion 92 of the clip inwardly against the front lower corner 104 of the shelving to retain the clip securely in position. The mounting of the label and label holder on the clip is as previously described.

30 Fig. 19 illustrates a modified form of label holder which comprises an extruded section of uniform cross

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section comprising a back wall 110 and upper and lower outwardly extending flange walls 111, 112. Both of the flange walls have recesses 113, 114 adjacent the back wall 110, for the reception of edge flanges of an electronic label enclosure, shown in broken lines at 115. The holder of Fig. 19 includes a co-extruded pad 116 of soft plastic material projecting slightly forward from the surface of the back wall 110, adjacent at least one of the recesses 113, 114. When an electronic label unit is pressed into the holder, the flange walls 111, 112 are displaced sufficiently to allow the edge flanges of the label to be received in the recesses 113, 114, and the soft pad 116 serves to press outward on the label enclosure to retain it tightly in position.

At the front of the label holder, a clear cover 117 is provided, which is co-extruded with the remainder of the holder, being attached thereto by a co-extruded living hinge portion 118 extending along the upper flange wall 111. At its lower end, the cover is provided with a locking section 119 that can be snapped over a bead flange 120 at the front of the lower flange wall 112 to retain the cover in a normally closed position. Advantageously, a small clearance space is provided between the cover 117 and the front 115 of the electronic label to provide a measure of protection against bumping of the cover.

As in the case of the label holder shown in Figs. 1-3, the label holder of Fig. 19 incorporates a mounting strip 121 which is co-extruded with the label holder and is flexibly attached thereto by a co-extruded living hinge portion 122. As will be understood, the label holder of Fig. 19, is advantageously mounted to the front of a display shelf by means of a mounting clip device such as described herein, with provision for setting desired

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viewing angles by installation of an angle bracket as shown in Figs. 4 and 5 herein.

Although it is not a preferred method of mounting the label holder, the mounting strip 121 can be configured to provide a flat back surface 123 which, in a particular case, can be adhesively secured to the front of a display shelf.

The label holder of Fig. 19 desirably incorporates an integrally extruded resilient clip 124 along the lower portion of the back wall. Among other things, the clip 124 enables a special temporary sign or the like 125 to be attached to the electronic label to call special attention thereto, for example.

In any of its various forms, the devices of the invention provide for significantly improved and economical mounting and display of electronic labels. The devices of the invention take into consideration the relatively high cost of such labels and their somewhat delicate nature, in providing for secure but resilient mounting of the electronic label in a manner to inhibit unauthorized movement or removal and to provide a reasonable measure of protection against accidental shocks and bumps from grocery carts or the like.

A particularly advantageous feature of the label holder is the provision of a simple, integrally, flexibly attached mounting strip, which not only provides for the expedient mounting of the label holder at the front of display shelving, but also provides for the reception of a resilient angle bracket by which the viewing angle of the electronic label may be optimally established.

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The device of the invention can be associated with a variety of simple, effective mounting clips, which enable the label holder to be easily and securely mounted to existing pricing channels, where such exist, or to the front of metal shelving provided with regularly spaced openings along the top surface of the shelf. The mounting clip shown in Figs. 7-10 is of an advantageous two-part construction wherein the mating parts are relatively laterally adjustable along the line of mating inclined surfaces. This provides for a wide adjustment of the vertical dimension of the mounting clip, to accommodate a wide variety of pricing channels. In the forms of mounting clips shown in Figs. 11-15, one-piece mounting clips, formed of spring steel or the like are configured and dimensioned for reversible orientation such that, in one orientation the clip fits effectively in pricing channels of a first range of sizes, and in a second orientation the clip fits in pricing channels of a second range of sizes. Yet a third form of the clip attaches to openings in the top surface of perforated metal shelving.

In any of the forms of mounting clips disclosed herein, a forwardly displaced, upwardly extending mounting tongue is positioned to receive and retain a portion of the mounting strip flexibly attached to the label holder. In the case of the reversibly orientable, one-piece mounting clips of Figs. 11-15, upwardly extending arms of the clip serve in the functional capacity of an upwardly extending mounting tongue when the clip is "reversely" oriented.

It should be understood, of course, that the specific forms of the invention herein illustrated and described are intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly,

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reference should be made to the following appended claims in determining the full scope of the invention.

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We claim:

1 1. A device for mounting and displaying an electronic
2 label or the like at the front of a product display shelf
3 which comprises,
4 (a) a label holder formed of plastic material and shaped
5 and sized to receive and display an electronic label,
6 (b) a mounting strip permanently flexibly attached to an
7 upper portion of said label holder and having a portion
8 disposed rearwardly of a back wall of said label holder,
9 (c) said mounting strip portion being provided with a
10 downwardly opening slot, and
11 (d) a mounting element fixed to the front of said product
12 display shelf and having an upwardly extending mounting
13 tongue received in said downwardly opening slot and
14 supporting said label holder and electronic label in front
15 of said display shelf.

1 2. A device according to claim 1, wherein
2 (a) said label holder has a predetermined length,
3 (b) said mounting strip extends for a length equal to the
4 length of said label holder,
5 (c) the mounting tongue of said mounting element has a
6 width substantially less than the length of said mounting
7 strip and is received in a fractional length portion of
8 said mounting strip.

1 3. A device according to claim 2, wherein
2 (a) an angle bracket having an upwardly extending portion
3 and an outwardly extending portion is mounted with said
4 upwardly extending portion inserted in the downwardly
5 opening slot of said mounting strip and the outwardly
6 extending portion extending forwardly into contact with a
7 back wall portion of said label holder to support said
8 label holder and said electronic label at a predetermined
9 viewing angle.

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1 4. A device according to claim 3, wherein
2 (a) the respective portions of said angle bracket are of
3 different length, and
4 (b) said respective portions are alternatively insertable
5 into said downwardly opening slot whereby to present
6 outwardly extending portions of different length for
7 supporting said label holder and label alternatively at
8 different viewing angles.

1 5. A device according to claim 3, wherein
2 (a) said angle bracket is formed of resilient plastic
3 material to accommodate limited pivoting motion of said
4 label holder in response to external force.

1 6. A device according to claim 1, wherein
2 (a) said label holder and said mounting strip are formed
3 as a continuous extrusion, and
4 (b) said mounting strip is joined with said label holder
5 by a continuously co-extruded living hinge of soft plastic
6 material.

1 7. A device according to claim 1, wherein
2 (a) said label holder includes upper and lower forwardly
3 extending flange walls,
4 (b) said flange walls being spaced apart a distance to
5 closely and snugly receive an electronic label,
6 (c) a clear plastic cover extending over the face of said
7 electronic label and being spaced therefrom.

1 8. A device according to claim 7, wherein
2 (a) said cover is provided at one edge with a co-extruded
3 hinge portion mounted to one of said flange walls.

1 9. A device according to claim 8, wherein

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2 (a) said co-extruded hinge portion is co-extruded with
3 said one flange wall.

1 10. A device according to claim 1, wherein
2 (a) said back wall is formed with an integrally extruded
3 clip portion adjacent a bottom edge of said back wall and
4 defining a downwardly opening slot for the reception of a
5 conventional label element.

1 11. A device according to claim 7, wherein
2 (a) the electronic label is provided along its upper edge
3 with an upwardly projecting edge flange, and
4 (b) the upper flange wall of said label holder is formed
5 with a recess for the reception of said edge flange.

1 12. A device according to claim 11, wherein
2 (a) the back wall of said label holder is formed with a
3 co-extruded pad of soft plastic material in a region
4 adjacent said upper flange wall to bear resiliently against
5 a portion of said electronic label positioned in overlying
6 relation therewith.

1 13. A device according to claim 1, wherein
2 (a) said mounting element is formed at least in part of
3 spring metal material, whereby said mounting tongue
4 provides for resilient mounting of said label holder.

1 14. A device according to claim 1, wherein
2 (a) said mounting element is adapted for reception in a
3 pricing channel and is formed of upper and lower parts,
4 (b) said parts being adapted for laterally sliding
5 relation with a lower edge portion of said upper part
6 slidably engaging an upper edge portion of said lower part,
7 (c) said upper and lower edge portions being inclined
8 with respect to said display shelving, whereby the

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9 effective height of said mounting element can be adjusted
10 to fit a variety of sizes of pricing channels.

1 15. A device according to claim 14, wherein
2 (a) one of said parts is formed of sheet metal,
3 (b) the other of said parts is formed of plastic,
4 (c) the part formed of plastic is formed with a slot for
5 the reception of the part formed of sheet metal.

1 16. A device according to claim 15, wherein
2 (a) the inclined edge of said one part is formed with
3 serrations or the like for engagement with the inclined
4 edge of said other part.

1 17. A device according to claim 1, wherein
2 (a) said mounting tongue is formed with a staked-out
3 retaining tab positioned for engagement with said mounting
4 strip to inhibit separation of said mounting strip from
5 said mounting tongue.

1 18. A device according to claim 1, wherein
2 (a) said mounting element is adapted for reception in a
3 pricing channel mounted on said product display shelf,
4 (b) said mounting element comprises a one-piece section
5 of spring metal material formed with a body portion,
6 upwardly extending portions, downwardly extending portions
7 and a mounting tongue extending outwardly and upwardly from
8 said body portion,
9 (c) the distance between extremities of said downwardly
10 extending portions and of said mounting tongue is different
11 than the distance between extremities of said downwardly
12 extending portions and said upwardly extending portions,
13 (d) said mounting element being adapted for installation
14 in said pricing channel alternatively in one orientation,
15 in which the mounting element engages said pricing channel

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16 by said upwardly and downwardly extending portions, and a
17 second orientation, in which the mounting element engages
18 said pricing channel by said mounting tongue and said
19 downwardly extending portions.

1 19. A device according to claim 18, wherein

2 (a) said upwardly extending portions and said mounting
3 tongue are formed with staked-out, downwardly extending
4 tabs for alternative reception in said downwardly opening
5 slot.

1 20. A device according to claim 1, wherein

2 (a) said mounting element is adapted for mounting at the
3 front of shelving provided with regularly spaced openings
4 along the surface of the shelving,

5 (b) said mounting element is formed of spring metal
6 material and comprises a pair of spaced apart downwardly
7 extending tabs adapted for reception of a pair of spaced
8 openings in said shelving,

9 (c) said mounting element further comprising a clamping
10 portion adapted for reception over bottom portions of said
11 shelving.

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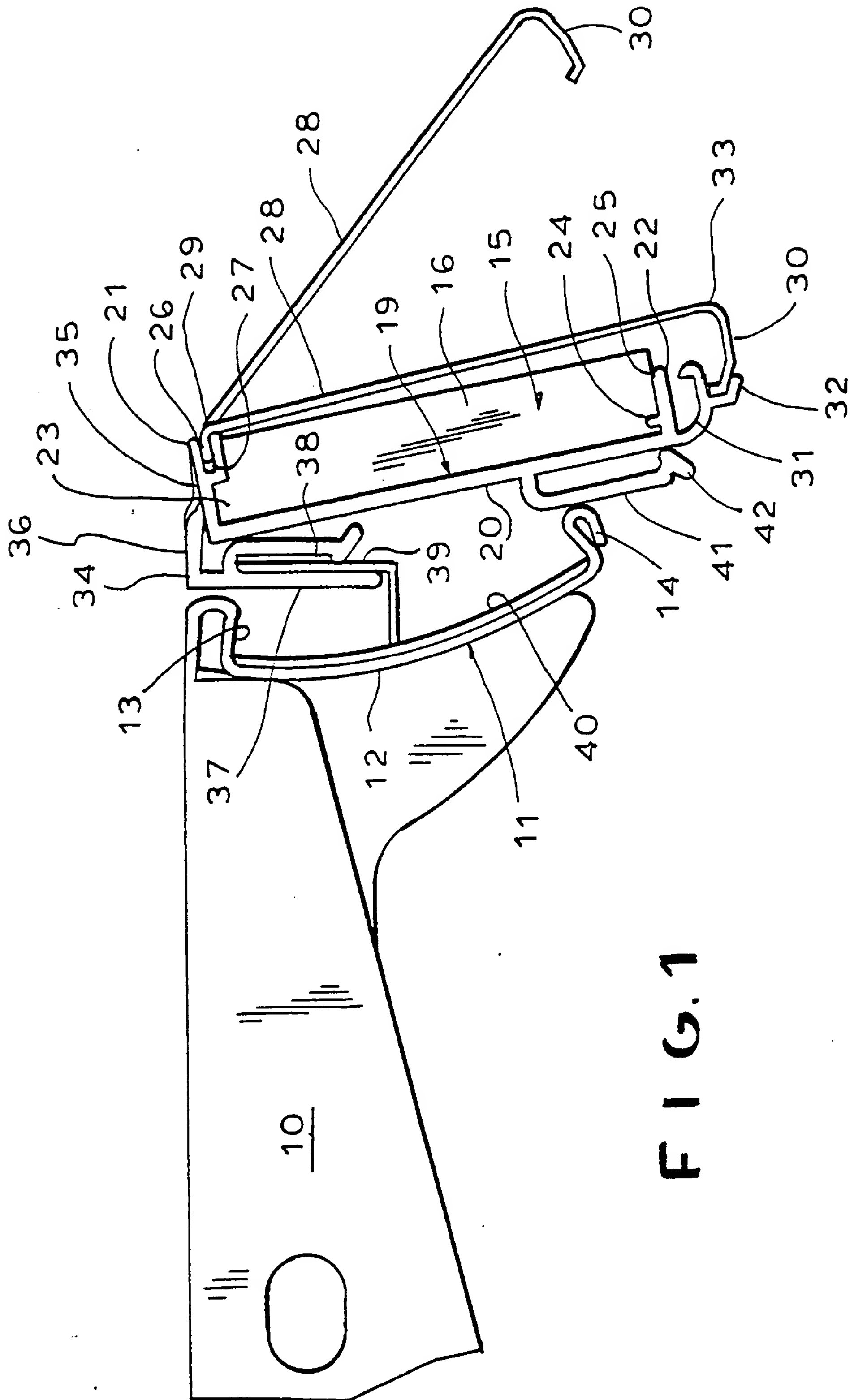


FIG. 1

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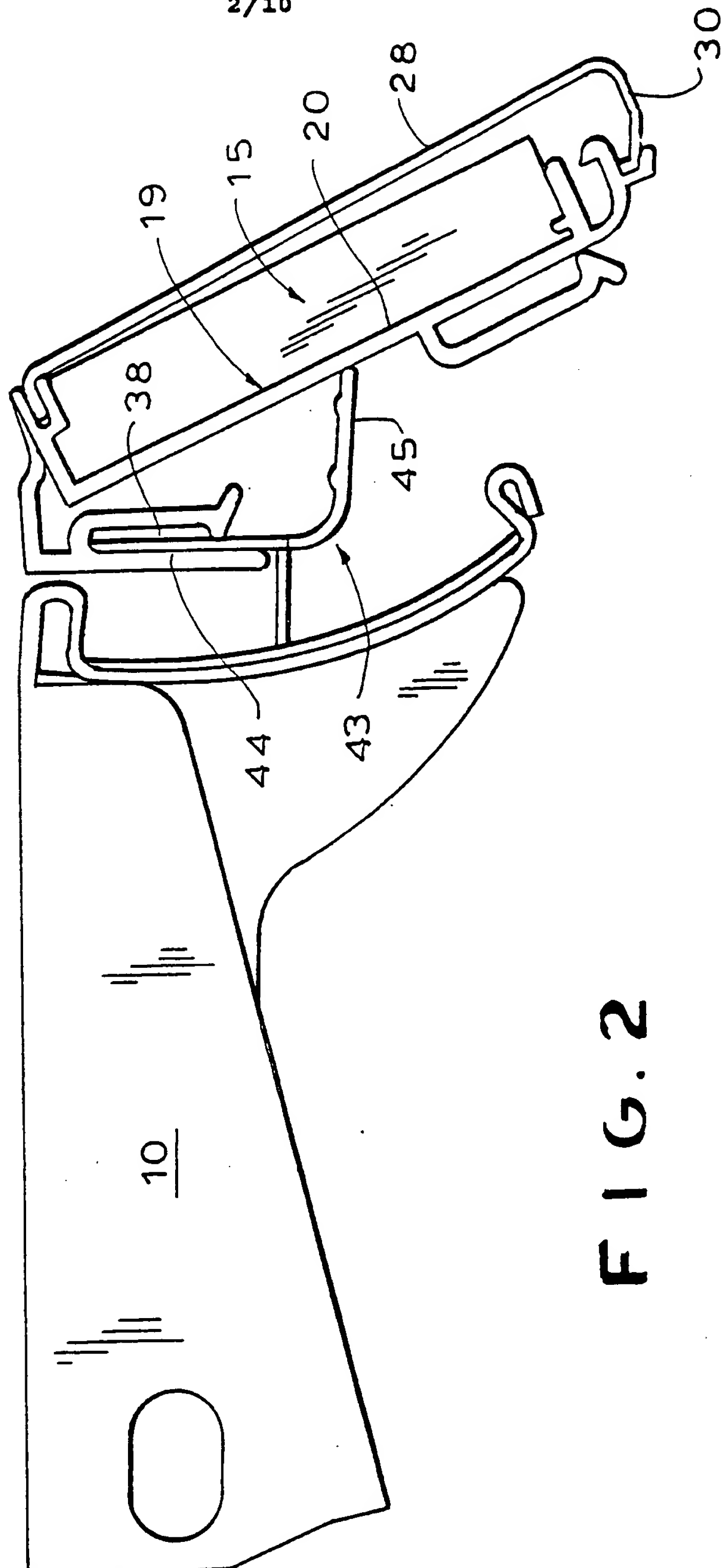


FIG. 2

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FIG. 3

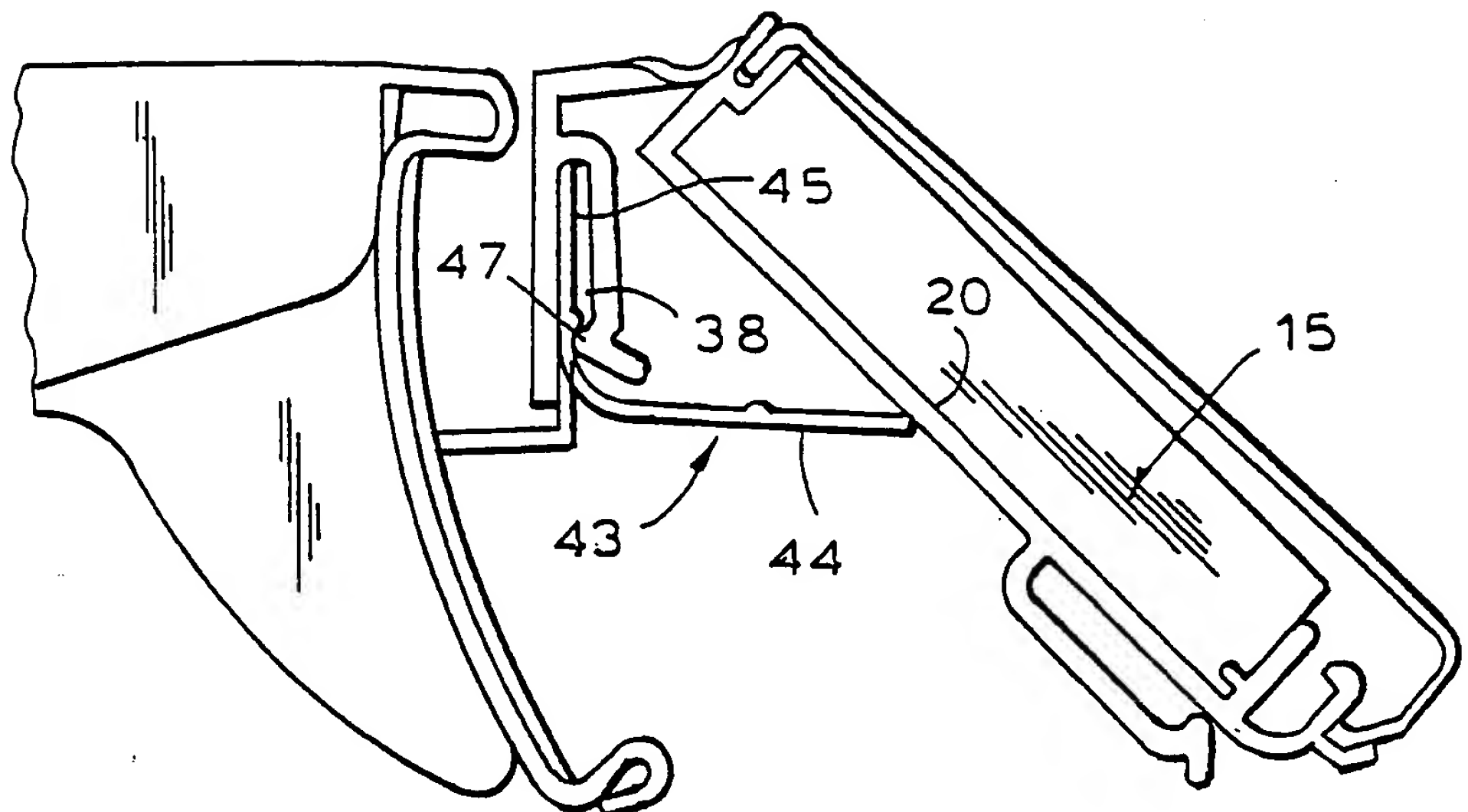


FIG. 4

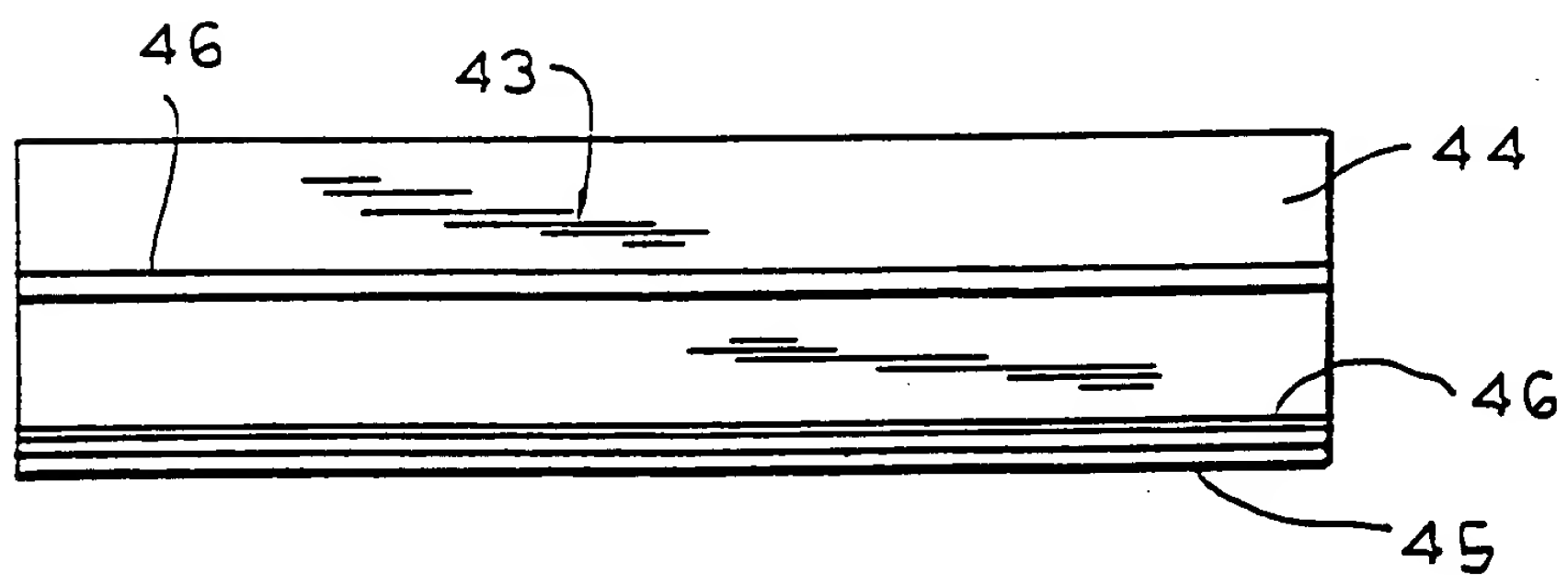
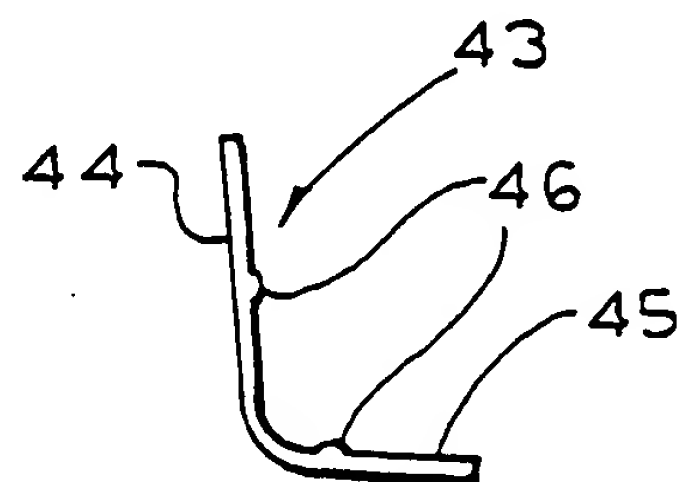
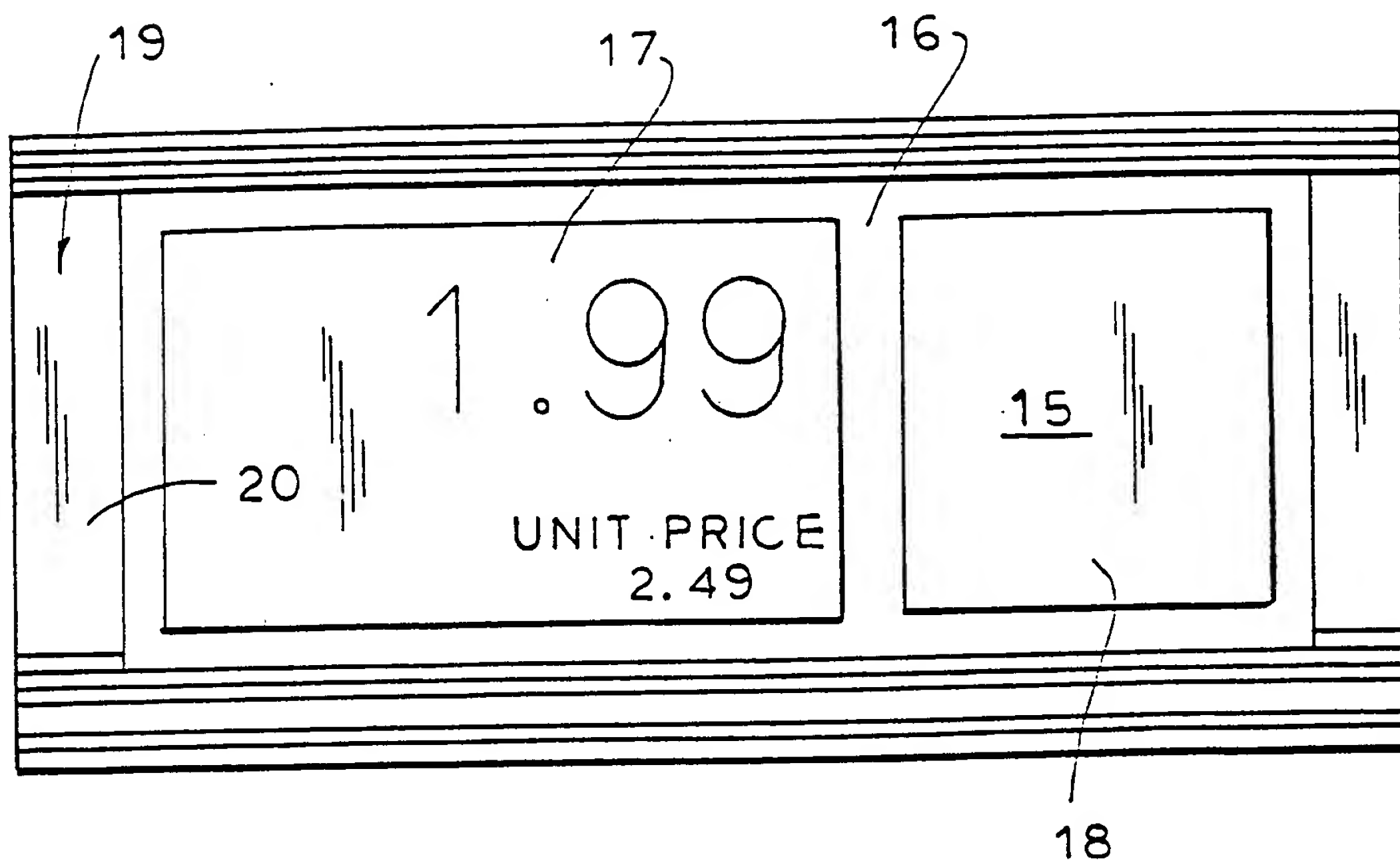
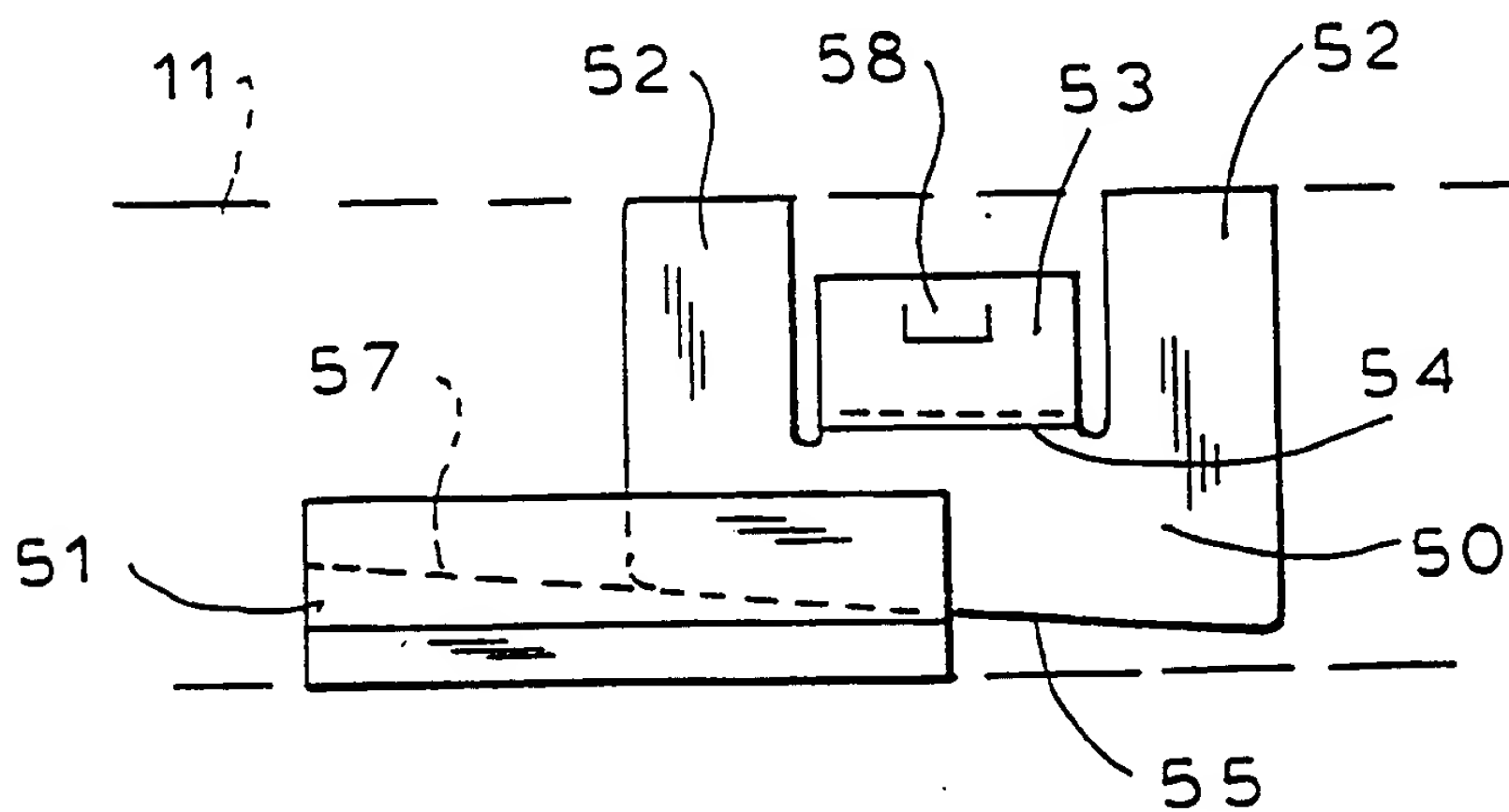


FIG. 5



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FIG. 6**FIG. 9**

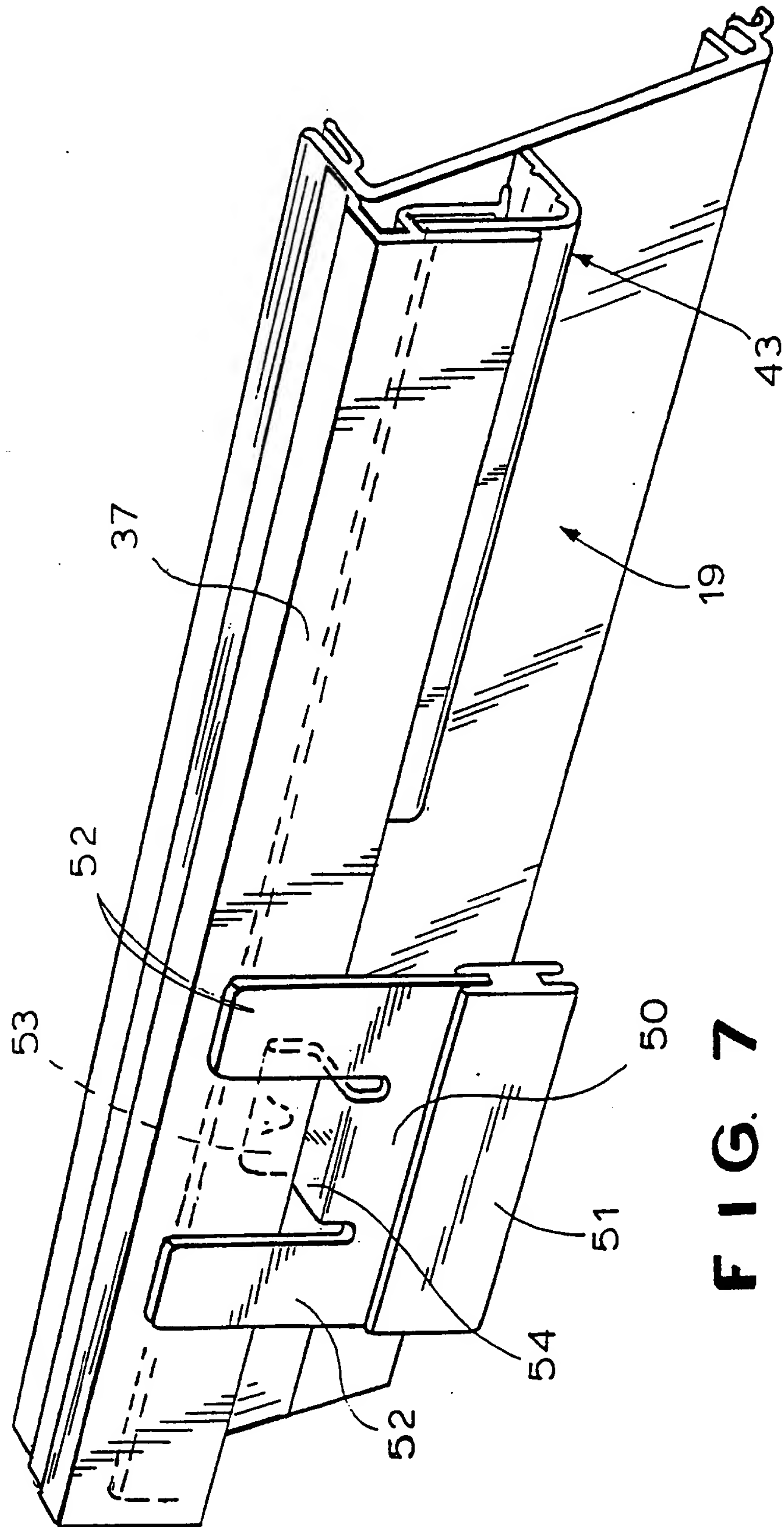
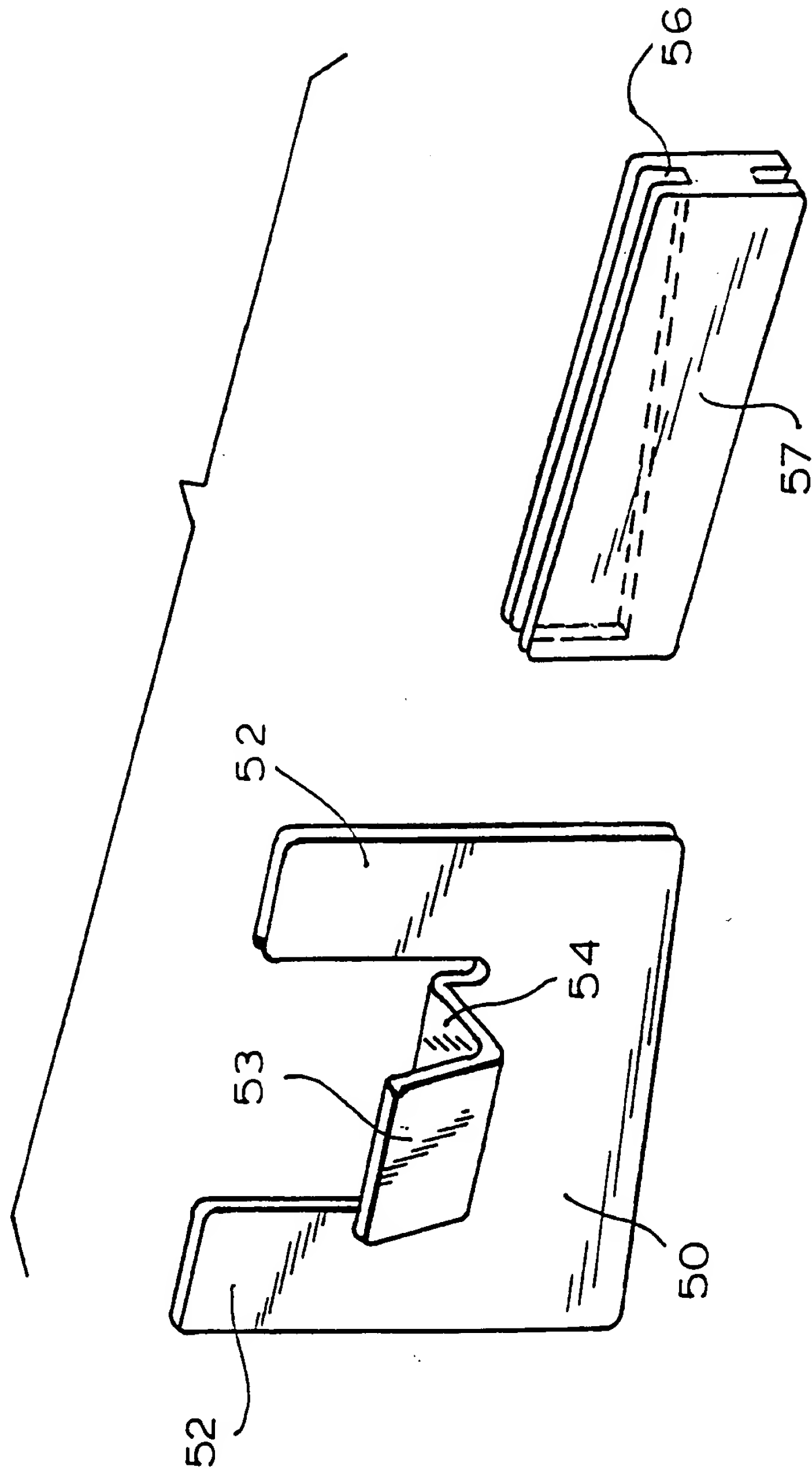


FIG. 7

FIG. 8



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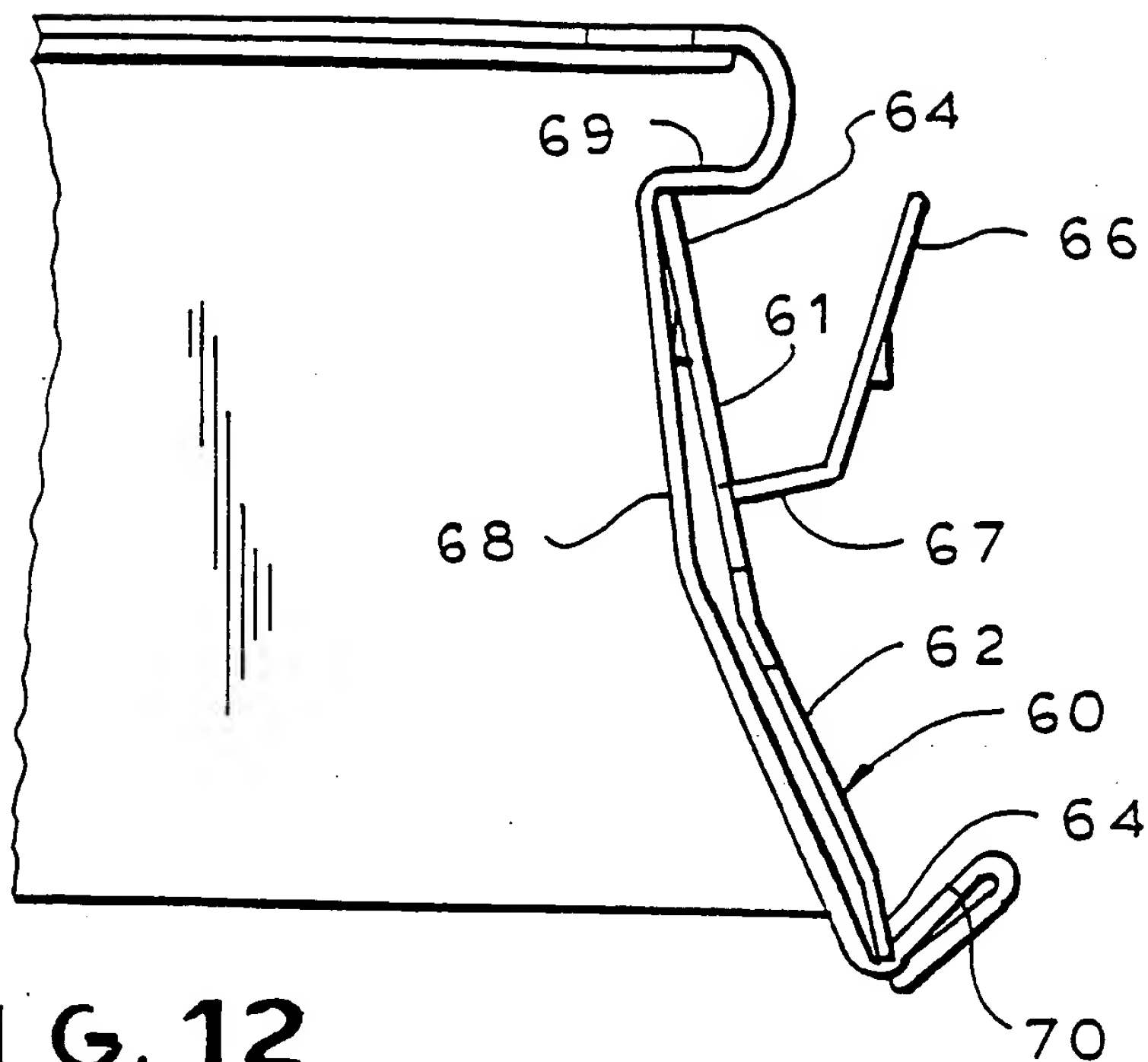


FIG. 12

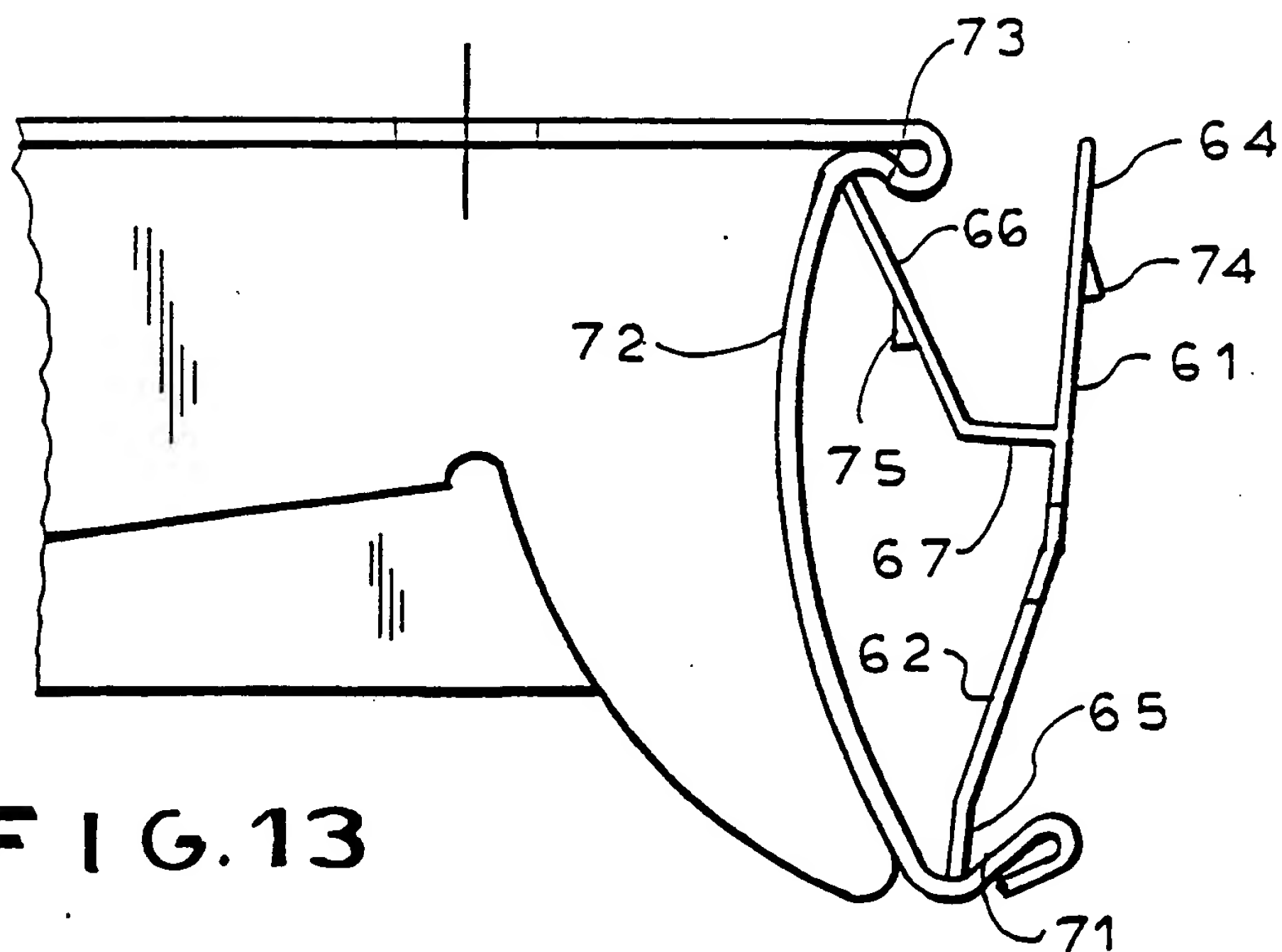


FIG. 13

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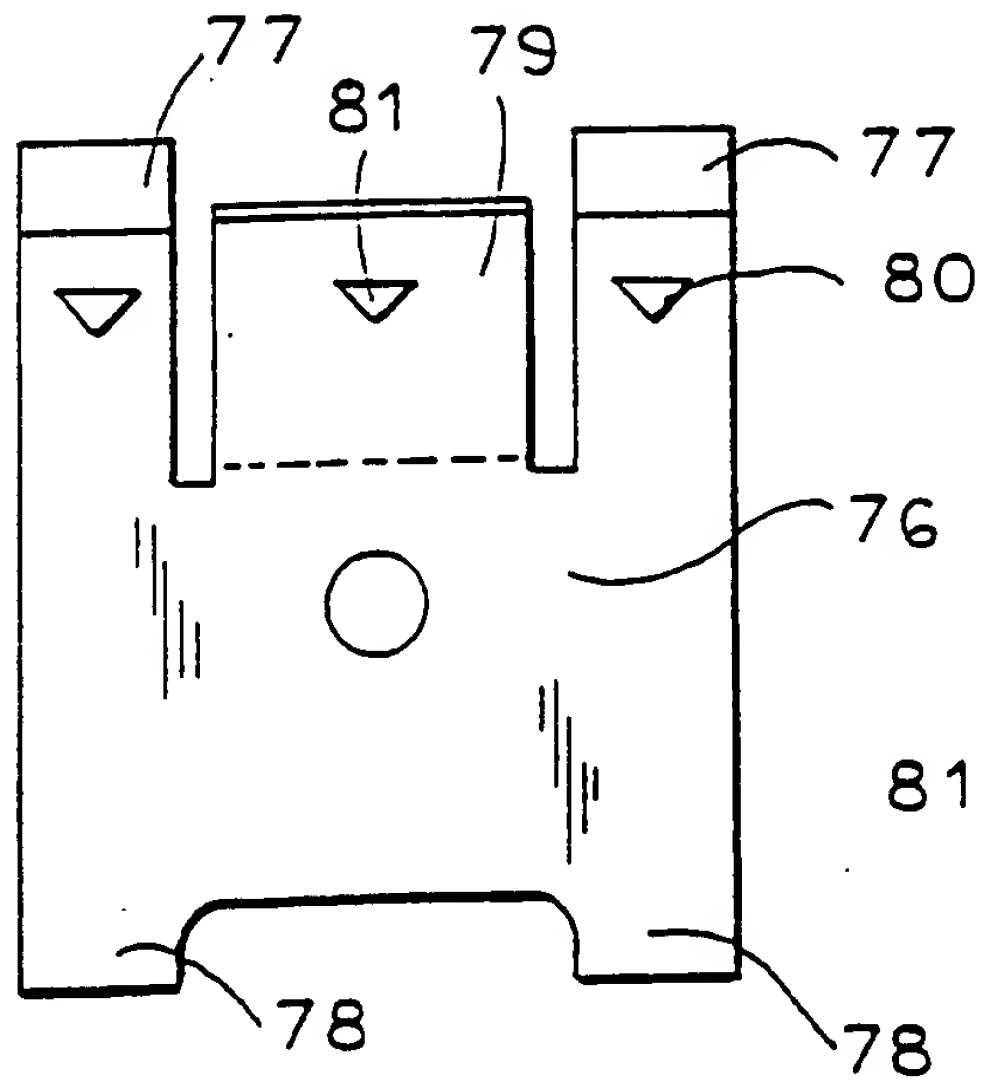


FIG. 14

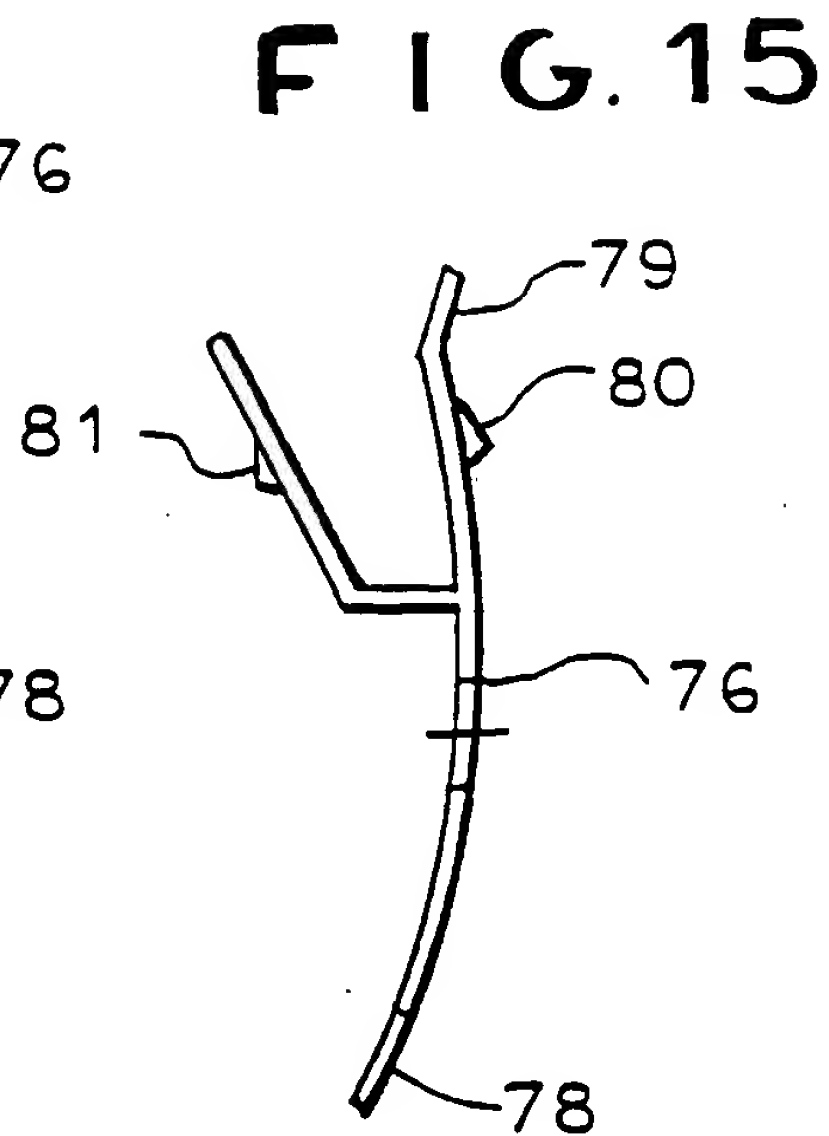


FIG. 15

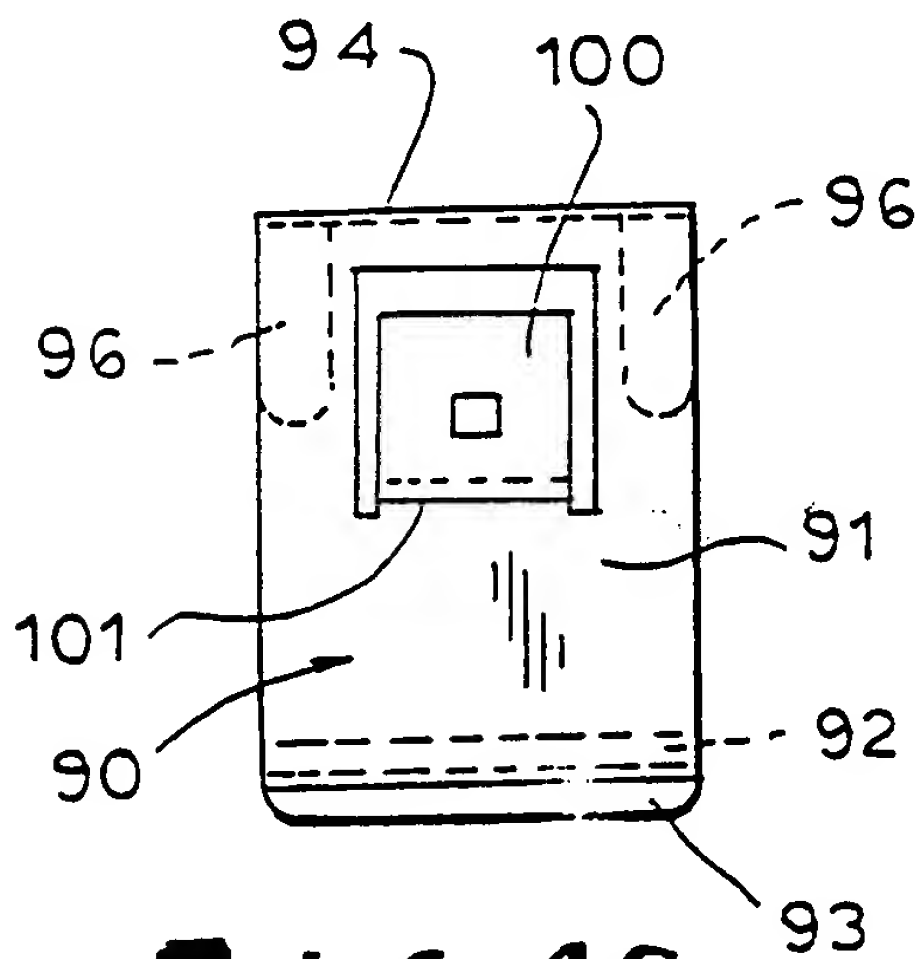


FIG. 16

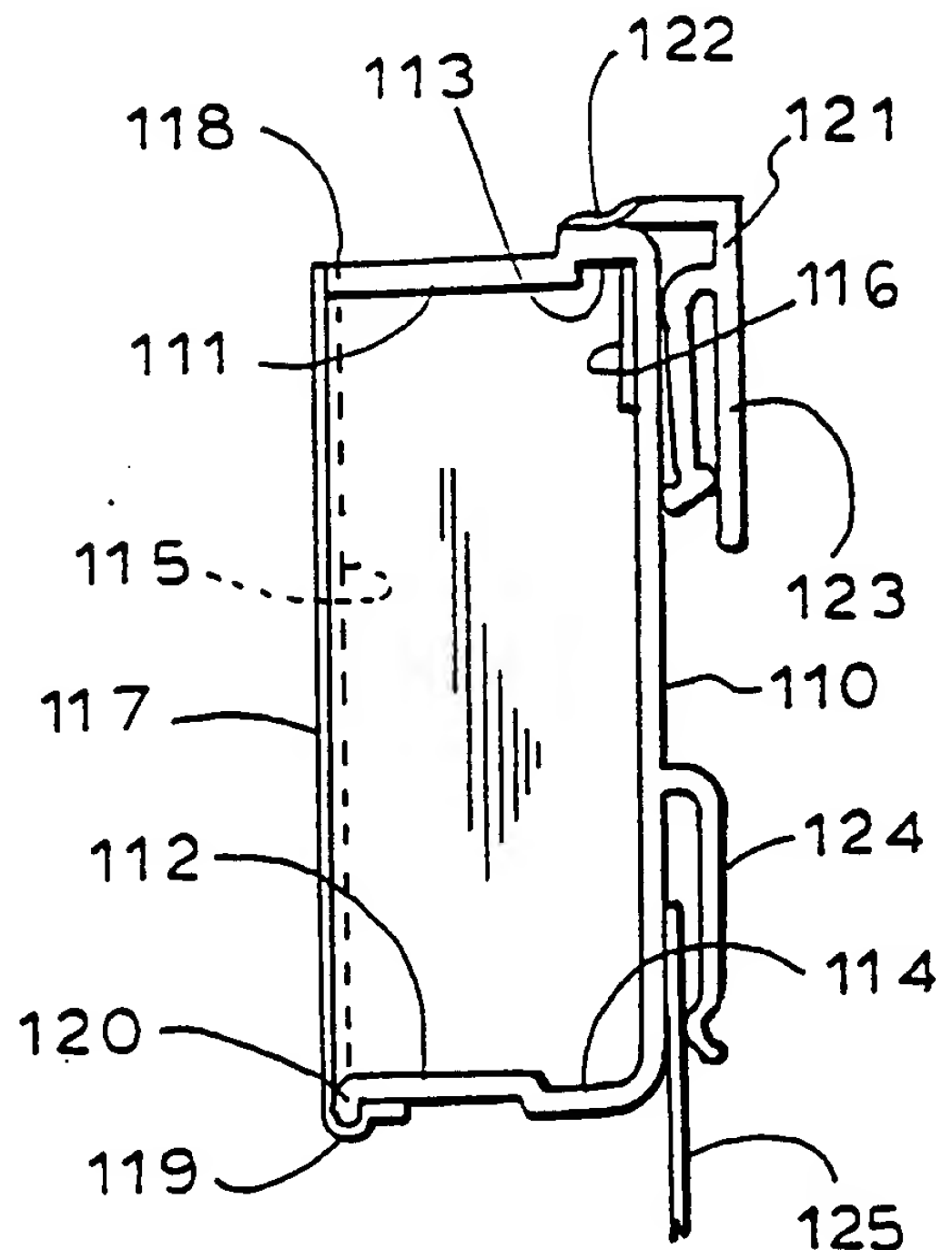
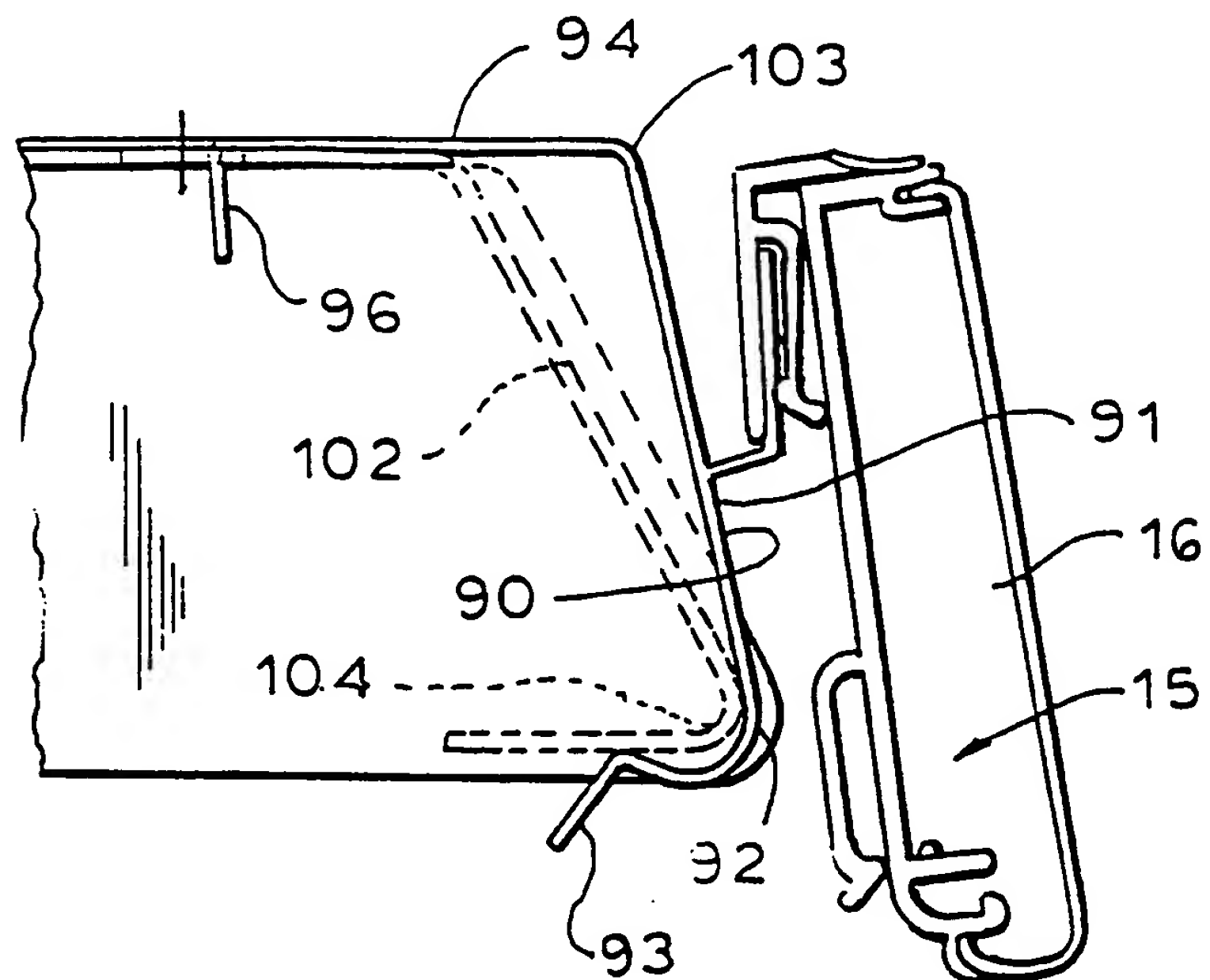
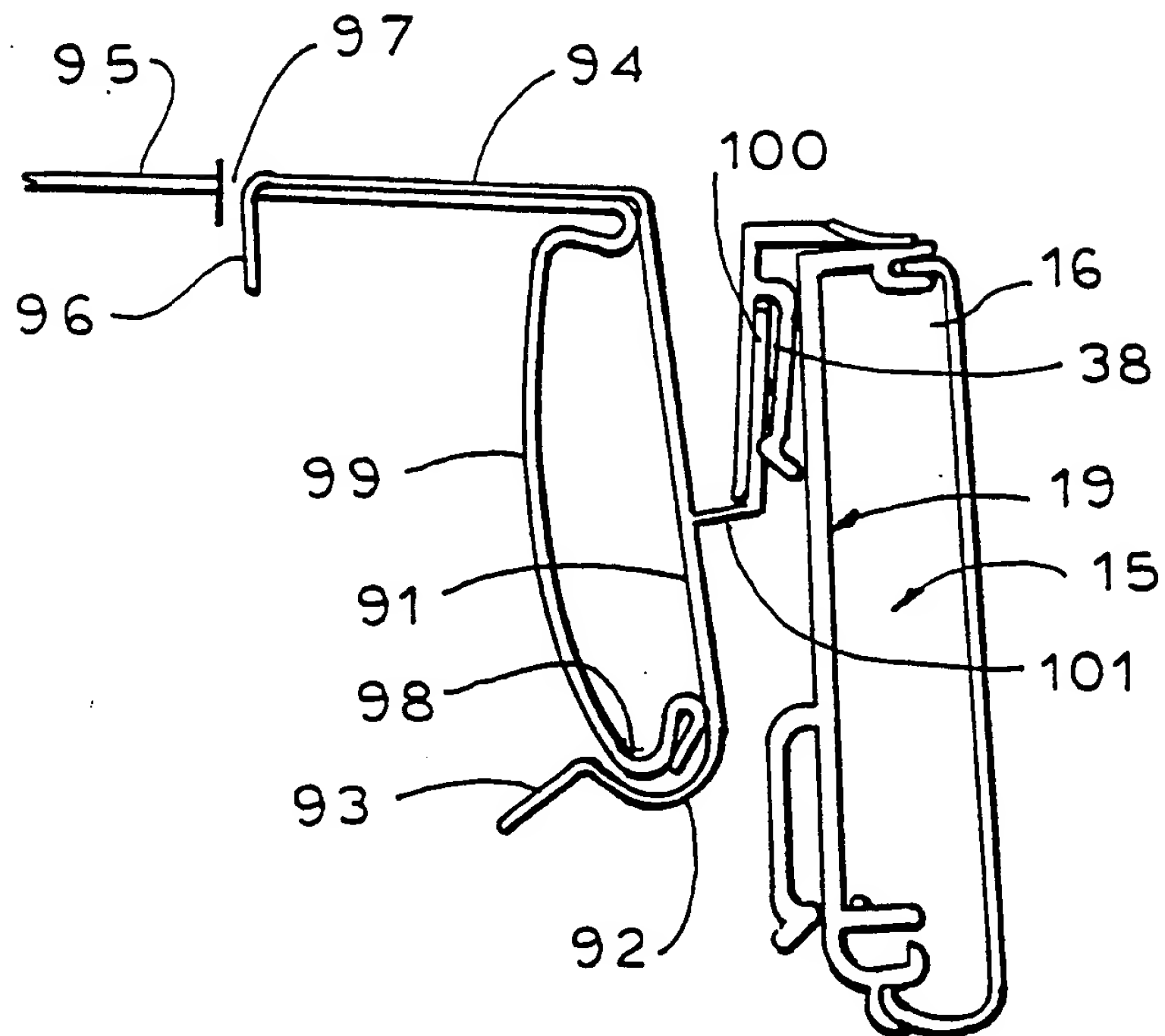


FIG. 19

FIG. 17^{10/10}**FIG. 18**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/00233

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G09F 3/18

US CL : 40/661.03, 642.02, 658, 661.06; 248/220.21

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 40/661.03, 642.02, 658, 661.06; 248/220.21

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,483,502 A (FAST) 20 NOVEMBER 1984 (20.11.84) SEE FIGURES 11-12	1-20
A	US 1,973,413 A (McDONNELL) 11 SEPTEMBER 1934 (11.09.34) SEE FIGURE 1-2	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search

25 MAY 1998

Date of mailing of the international search report

23 JUN 1998

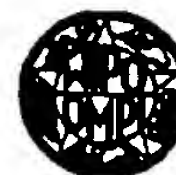
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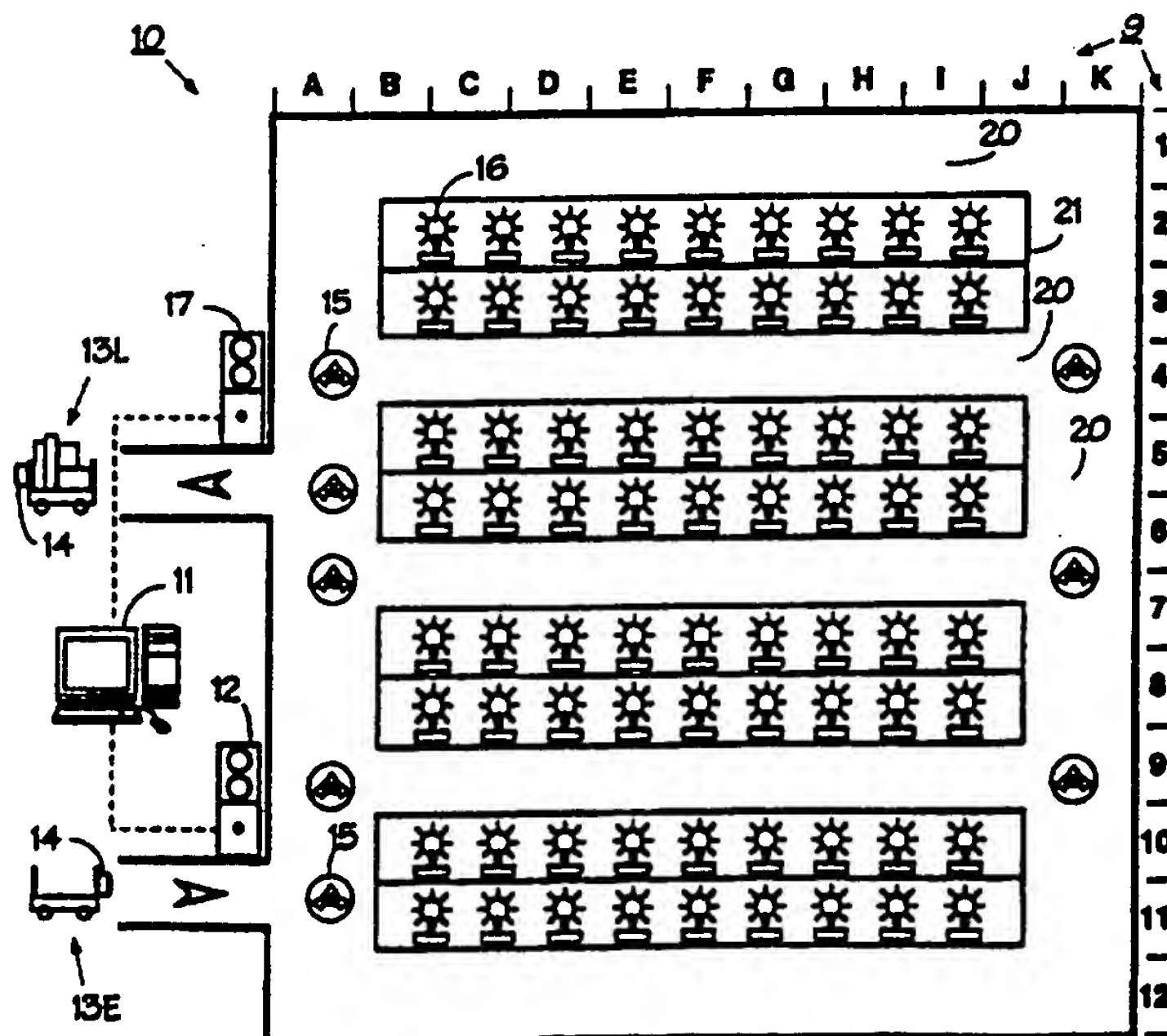
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(54) Title: GUIDANCE SYSTEM USING CHANGEABLE SIGNS

(57) Abstract

A guidance system for guiding a user to selected targets located within a defined area, such as a warehouse, museum, parking garage, etc., includes a portable unit to be carried by each user and having a memory for storing target information identifying a selected target within the defined area, and a transmitter for transmitting signals identifying the selected target within the defined area. The system further includes at least one changeable guidance sign at a predetermined location within the defined area for receiving signals transmitted by a portable unit and for displaying stored guidance information of the location of a target corresponding to a signal transmitted from the portable unit, and/or a plurality of target devices at the target location for receiving target signals transmitted by a portable unit and for indicating that a received target signal identifies the respective target.



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GUIDANCE SYSTEM USING CHANGEABLE SIGNS

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to guidance systems and in particular to such
5 systems using changeable signs to lead a person to a predefined target.

Many human activities involve the need to reach a predefined location or
object. Guidance means for choosing a preferred route or for identifying the
target location or object are in common use, usually in the form of signs. Such
10 signs, clearly visible from a fair distance, allow a person to choose the route to
the target without interrupting the travel or risking travel safety. However, when
the number of possible routes or targets is large, the use of common signs
becomes impractical, because too much visual information must be displayed
and then read and interpreted during travel. A changeable sign system capable
15 of providing selectively guidance signals relating to a specific route or target of
an individual, could be highly advantageous in such circumstances.

An example of an existing environment using changeable signs displaying
route and target information is the so-called pick-to-light (PTL) system for
warehouses. Such commercial systems and their advantages are described in
20 the article "Pick-to-light directs productivity: however you store materials, PTL
indicators make for timely and accurate orderpicking" by Schwind, Gene F.,
Material Handling Engineering, Dec 1993, Page 43, downloaded through
Compuserve Information Services. In such pick-to-light systems, the pick
assignments are stored in a central computer. The central computer
25 communicates with terminals positioned next to stock locations. When a certain
pick assignment is activated by the central computer, lights in the corresponding
terminals are turned on to provide the picker with clear visual guidance signals.
Additional information may be generated by the central computer and displayed
by the terminal, such as information relating to the pick quantity. The terminal
30 may also include input means for keying-in and uploading pick r ports. Other
prior art references relating to pick-to-light systems include US patents

3,739,339 to Hillhouse et al., 3,908,800 to Drapeau and 4,346,453 to Drapeau et al.

While having many advantages regarding productivity and accuracy, the existing pick-to-light systems have two major limitations: they can serve only a single picker or a small number of pickers operating simultaneously, and they require a costly communication infrastructure between the central computer and all terminals.

OBJECT AND BRIEF SUMMARY OF THE INVENTION

The following terms will be used herein as follows:

- 10 1. Assignment — a task to be performed including traveling toward and reaching a target location.
2. Operator — a human individual executing an assignment while traveling by foot or by a vehicle.
3. Guidance — the information provided to an operator for aiding in choosing a preferred route and/or in identifying the target location or item.
- 15 4. Sign — an object positioned next to traffic routes or target locations for displaying guidance information viewable by an operator from a fair distance and usable by operator without interrupting travel. Signs may incorporate lights and symbols for visibility and clarity.
- 20 5. Changeable sign — a sign which changes the information displayed thereon upon receiving an external signal.
6. Central computer — a computer storing assignment information.

The main object of the present invention is to provide a guidance system using changeable signs, which system can serve simultaneously a large number of operators and does not require a central computer, or a communication link between a central computer and the signs. Another object of the present invention is to provide an assignment reporting system operable in conjunction with said guidance system.

According to one aspect of the present invention, there is provided a guidance system for guiding a user to selected targets among a plurality of targets located within a defined area, comprising:

a portable unit to be carried by the user, including a memory for storing target information identifying a selected target within said defined area, and a transmitter for signals identifying the selected target within said defined area;

and at least one changeable guidance sign at a predetermined location within said defined area, said changeable guidance sign including a receiver for receiving signals transmitted by said portable unit, a memory for storing guidance information relating the locations of said plurality of targets with respect to said predetermined location of the changeable guidance sign, a display for displaying the stored guidance information of the location of a target corresponding to as signal transmitted from said portable unit and received by the changeable guidance sign.

According to another aspect of the present invention, there is provided a guiding system for guiding a user to selected targets among a plurality of targets located within a defined area, comprising:

a portable unit to be carried by the user, including a memory for storing target information identifying a selected target within said defined area, and a transmitter for transmitting signals identifying the selected target within said defined area;

a plurality of target devices, one at each of said target locations, each of said target devices including a receiver for receiving target signals transmitted by said portable unit, and a target indicator for indicating that a received target signal identifies the respective target;

and a computer for storing said target data identifying the targets within said defined area, and for communicating with said portable unit to download into their respective memories the target information identifying selected targets within said defined area.

A number of applications of the invention are described for purposes of example, including a warehouse for storing a large number of articles, a

museum having a large number of exhibits, and a parking garage having a large number of parking spaces.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic illustration of a layout of a guidance system according to the present invention.

Fig. 2A—C are schematic illustrations of the signs in the system of Fig. 1.

Fig. 3 is a schematic block diagram of a portable unit according to the present invention.

Fig. 4 is a schematic block diagram of a changeable traffic sign according to the present invention.

Fig. 5 is a schematic block diagram of a changeable target sign according to the present invention.

Fig. 6A—C are examples of data structures maintained in and communicated between various components of the present invention.

Fig. 7A—C are examples of alternative data structures maintained in and communicated between various components of the present invention.

Fig. 8 is a schematic block diagram of a changeable traffic sign with a multiple signal unit.

Fig. 9 is a flowchart describing the operation of the present invention.

Fig. 10 is a schematic illustration of a layout of another variation of the guidance system according to the present invention.

Fig. 11 is a flowchart describing the operation of the variation of Fig. 10.

Fig. 12 is a schematic illustration of an alternative layout of a variation of the guidance system according to the present invention.

Fig. 13 is a block diagram of a changeable target sign adapted to the variation of Fig. 12.

Figs. 14A-D illustrate the data in the assignment memory, guidance table, guidance signal and assignment table, according to the variation of Fig. 12.

Fig. 15 is a flowchart describing the operation of the variation of Fig. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to Fig. 1 and 2A—C illustrating a layout of a preferred embodiment of the present invention, where the guidance system of the present invention is used to aid operators in executing pick assignments in a warehouse.

Warehouse 10 accommodates grouped merchandise items (not shown) on shelves 21. Passageways 20 allow access to the merchandise items. At each junction formed by the passageways there is provided a changeable traffic sign 15. A changeable target sign 16 is positioned next to each group of identical merchandise items. The entire area is divided into cells by coordinates 9, to allow coarse location identification by coordinates such as B5, H11 etc. It would be appreciated that such coarse identification of locations can alternatively use room numbers, aisle numbers or other symbols; and the term "coordinates" should be interpreted hereinafter in its broader sense, as symbols coarsely identifying localities within the operational area.

An operator, using empty cart 13E and a portable unit 14 attached to the cart, reports at a check-in unit 12. Upon identifying the operator, central computer 11 allocates an assignment for the operator and downloads it to portable unit 14 through check-in unit 12. Upon receiving a "Green" light from traffic light 26 of the check-in unit (Fig. 2C), which confirms the successful download of the assignment information, the operator enters the first junction. By communicating with the changeable traffic sign 15, the portable unit 14 transmits thereto traffic information signals, transformed thereon into visible traffic directions. When arriving to a line of sight with the target destination, as identified by the target sign ID transmitted by the portable unit 14, the respective target sign 16 responds with a visible signal, identifying the adjacent target location. The operator may use an optional operator interface 32 on portable unit 14 (Fig. 3) to enter assignment report information into the portable unit, such as the extent of the assignment completion. After the assignment completion, the operator moves to the next traffic sign 15, where he receives

directions which lead him either to the next assignment, or toward the checkout unit 17, where portable unit 14 uploads assignment report information, and then the loaded cart 13L has completed its loading assignment.

Fig 2A illustrates (the appearance of) a changeable traffic sign 15. Infrared receiver (or transceiver, according to the selected embodiment) 23 is operative to communicate with portable unit 14. Light arrows 22A, 22L and 22R are actuated to guide the operator to move ahead, to the left or to the right, respectively. Alphanumeric sign 22D displays information identifying the operator or the assignment.

Fig. 2B illustrates a target sign 16. Infrared receiver (or transceiver, according to the selected embodiment) 25 is operative to communicate with portable unit 14. Light 24L signals to identify the selected target, and alphanumeric display 24D operates to display the operator's ID and assignment information, e.g. the quantity of items to be picked.

Fig. 2C illustrates a terminal unit functioning as a check-in unit 12 (or as a checkout unit 17). The terminal unit communicates with portable unit 14 through IR transceiver 27. Red-Green lights 26 provide the operator with visible indication whether the upload/download of information from/to the portable unit has been completed.

Reference is now made to Fig. 3 which is a block diagram of portable unit 14. Portable unit controller 30 controls the operation of the unit. Operator ID register 34 includes the operator's name or code, which is preloaded during the unit's initialization, and is used to identify the operator when uploading or downloading assignment information, and when communicating with traffic and target signs to identify the operators identity thereon. Operator interface 32, e.g. a keyboard and LCD display, is used to key-in the operator's ID, to be stored in register 34, and assignment report information, to be stored in assignment memory 31. Assignment memory 31 contains assignment information downloaded from computer 11 through check-in unit 12, and report information keyed-in through operator interface 32.

Infrared transmitter 36 and receiver 38, driven through drivers 35 and 37, respectively, are operative to communicate with traffic signs 15, target signs 16, check-in units 12 and check-out units 17. Power supply 33 energizes all other parts of the portable unit 14.

5 Fig. 4 is a block diagram of the changeable traffic sign 15 of Fig. 1. Controller 40 controls all the operations of the sign. Guidance table 41 includes preloaded information useful for guiding the operator, as will be described in relation to Figs. 6B and 7B below. Traffic display 22, driven through driver 43, shows visual guidance signals as described in relation to Fig. 2A. The visual
10 guidance signals are displayed for a predetermined delay after the actuating signal, received from portable unit 14, ceases. Receiver 44, driven through driver 45, is operative to receive signals from portable units 14. Transmitter 47 and driver 46 are optional for transmitting signals to portable units 14, if the embodiment of Figs 7A-C is selected. Power supply 42 energizes the other
15 parts of the changeable traffic sign.

Fig. 5 is a block diagram of the changeable target sign 16 of Fig. 1. Controller 50 controls all the operations of the sign. Target ID register 51 includes preloaded target ID information identifying the target, e.g. the code of the adjacent items identified by the sign. Target display 24, driven through driver
20 53, shows visual signals as described in relation to Fig. 2B. The visual signals are displayed for a predetermined delay after the actuating signal, received from portable unit 14, ceases. Receiver 54, driven through driver 55, is operative to receive signals from portable units 14. Transmitter 57 and driver 56 are optional for transmitting signals to portable units 14, if the embodiment of Figs 7A-C is
25 selected. Power supply 52 energizes the other parts of the changeable target sign.

Figs. 6A-C and 7A-C relate to two preferred embodiments of the data distribution between the portable unit and the changeable signs: The embodiment of Figs. 6A-C simplifies the portable unit and allows receive-only
30 operation of the changeable traffic signs 15. The embodiment of Figs. 7A-C simplifies the data stored in the changeable traffic signs, but requires more

complicated data in the portable units as well as receive-transmit capability at the changeable traffic signs 15.

Fig. 6A illustrates the data stored in the assignment memory 31 of portable unit 14 in Fig. 3, according to a first preferred embodiment. Each line describes a separate assignment. Each assignment is described by its target location coordinates (9 of Fig. 1), the ID of the target, corresponding to the content of the respective target ID register 51 (Fig. 5), and the assignment details. Memory space is reserved for report information for each assignment, to be keyed-in, upon assignment completion, through operator interface 32 (Fig. 3). Fig. 6B describes the contents of the guidance table 41 of Fig. 4 in said first preferred embodiment. Each traffic sign 15 includes a specific, preloaded table which contains directions to each possible coordinate designation. Thus, in the example of Fig. 6B, coordinate A1 (see 9 in Fig. 1) corresponds to the direction "LEFT", i.e. in order to reach the location A1, the operator should turn left at this specific sign. Other coordinates in the table may match directions such as "AHEAD" or "RIGHT" according to their actual physical location. Obviously, different signs will include different tables, according to their physical location. The table for each sign can be prepared manually or by using computer assistance. Fig. 6C relates to the same first preferred embodiment, describing the guidance signal transmitted continuously by portable unit 14 through transmitter 36 (Fig. 3). The guidance signal includes the target location, the target ID and the target details (all from Fig. 6A), and the operator ID (from register 34 of Fig. 3). When this guidance signal is received by a traffic sign (Fig. 2A) the sign displays the traffic direction according to the guidance table of Fig. 6B, and also shows the operator's ID, to avoid ambiguity among neighboring operators. When the signal is received by a target sign (Fig. 2B), the sign examines the signal's "target ID" contents, and if there is a match, the sign provides an eye-catching, visible signal and displays the operator ID and assignment details.

It would be appreciated that addressing (in Fig. 6A) each target by both its coordinates and target ID code is just a matter of practical

considerations. In an application such as a warehouse, there are two advantages to this approach: (a) locations in a warehouse accommodating 20,000 items may still be coarsely identified by, say, 100 coordinate symbols (A1-J10), sufficient for navigation among the changeable traffic signs, which will
5 reduce the size of and simplify the guidance table included in each traffic sign; (b) items in the warehouse may be moved from time to time to different locations; the target sign will then be moved with the corresponding items, the central computer will be updated to associate the moved items with their new location coordinates, but no change will be required in the memories of the
10 traffic and target signs. In other applications, however, where targets are fixed in their location, Fig. 6A may be modified by eliminating the "Target Location" column, in Fig. 6B the "Location" column will be replaced by "Target ID" column for specifying the directions from each sign to each target ID, and in Fig. 6C the "Target Location" data will be eliminated from the guidance signal.

15 Fig. 7A illustrates the data stored in the assignment memory 31 of portable unit 14 in Fig. 3, according to a second preferred embodiment. Each line describes a separate assignment. Each assignment is described by its entire route to the target location, the ID of the target, and the assignment details. The route is defined by a series of consecutive traffic signs and the
20 directions preassigned for each such sign; for example, assignment number 1 in Fig. 7A reads: "at sign #1 turn left; then, at sign #3 turn right; at sign #6 go straight ahead and at sign #8 turn right; then you are expected to hit item #1234 where you pick four boxes". Memory space is reserved for report information for each assignment, to be keyed-in, upon assignment completion, through
25 operator interface 32 (Fig. 3). Fig. 7B describes the contents of the guidance table 41 of Fig. 4 in said second preferred embodiment, which is simply the sign identification number used in the route directions of Fig. 7A. Fig. 7C relates to the same second preferred embodiment, describing the guidance signal transmitted continuously by portable unit 14 through transmitter 36 (Fig. 3). The
30 guidance signal includes the operator ID, and then the next segment of the assignment, which is a pair of either a sign # + direction (L/R/A), or the target ID

+ assignment detail, all taken from the assignment memory of Fig. 7A. In this case, the portable unit 14 communicates with changeable signs (traffic 15 and target 16), to actuate a visual response corresponding to the signal, and then receives an acknowledge signal from the sign, which causes the message
5 transmitted by the portable unit to change to the consecutive message from the assignment memory (Fig. 7A).

The calculation of the contents of the assignment memory, according to either Fig. 6A or 7A, is preferably made by central computer 11 of Fig. 1 and is downloaded to the portable unit 14 through check-in unit 12. The
10 calculation uses mapping information entered manually to associate target IDs with physical locations, and in Fig. 7A also route selection algorithms, such as those used in many navigation applications, to determine a preferred route for reaching the target. Alternatively, a manual planning of each assignment can be made by a human attendant, and keyed-in into central computer 11.

15 The reliability of the embodiment described in Figs. 7A-C is strongly dependent upon a flawless operation of the operator and all signs; a malfunction in a single sign, or a single unawareness to a traffic signal, may break the logical continuity of the route directions, thus leading to unresolvable situations. For this reason, the embodiment of Figs. 6A-C is preferable and,
20 unless otherwise specified, will be used hereinafter.

Fig. 8 describes a preferred embodiment for a changeable traffic sign, for environments where many operators operate simultaneously. In such a case, using the traffic sign of Figs. 2A and 4 may be insufficient, as several operators may approach the same traffic sign simultaneously. This embodiment,
25 adapted as an example to the case of Figs. 6A-C (no transmission capability is needed in the sign) receives guidance signals from portable units 14 through receiver 44. In this case, the transmission of guidance signals (Fig. 6C) should preferably occur with random intervals, so that if signals from two portable units 14 happen to coincide, then the next signals will probably be received without
30 interference. When a proper signal is received by changeable traffic sign 15 of Fig. 8, sign controller 80 assigns it to one of the plurality of displays 82A...82N; if

another signal is received before the first one expires, it is displayed on the next available display of 82A...82N, and so on.

Fig. 9 is a flowchart, summarizing the operation of a preferred embodiment of the system according to the present invention; reference is also made to Fig. 1. In block 90 the operator reports at check-in unit 12, where, in block 91, his assignment list is downloaded to his portable unit 14 in the form of a guidance table (e.g. Fig. 6A). A green light 26 on check-in unit 12 indicates that the download process has been completed, and the operator moves into the warehouse area, facing the first changeable sign (block 92), which is a traffic sign (blocks 93, 94). Traffic sign 15 receives a guidance signal (e.g. Fig. 6C) and responds with displaying traffic directions, by matching the direction instruction (from Fig. 6C) with the target location coordinates, according to the guidance table of Fig. 6B. The operator ID included in the guidance signal, is preferably also displayed by traffic sign 15, to assure the operator that the displayed message relates to him. The displayed traffic direction, e.g. in a form of an illuminated arrow, leads the operator to the next changeable sign (block 92), which is either a traffic sign or a target sign (block 93). If it is a traffic sign, the procedure described above repeats; if it is a target sign, at block 95 the sign with the matching target ID responds to the guidance signal (Fig. 6C) by blinking with an eye-catching light and displaying the assignment details, along with the operator ID, taken from the guidance signal of Fig. 6C. The operator then executes the assignment (still in block 95), and, if appropriate, keys-in report information into portable unit 14. If the assignment has been the last assignment, as indicated in the contents of the assignment (e.g. "pick 8 boxes and report at checkout #6"), the operator moves then to a checkout unit 17, where the report information is uploaded from portable unit 14 to central computer 11 via checkout unit 17. If the assignment has not been the last one in the assignment memory (Fig. 6A), the operator approaches the next traffic sign and the procedure described above is executed once again.

30

Another preferred embodiment will be described herein relating to a guidance system for museum visitors interested in visiting selected exhibits. This embodiment is described below in reference to Figs. 2A, 2B, 3, 4, 5, 6A-C 10 and 11.

5 Fig. 10 describes a museum 100 with halls and passageways 104 enabling visitors to access and observe exhibits. A target sign 16 is placed next to each exhibit. Traffic signs 15 are placed at each junction. At each entrance door 101E there is a basket 102E containing portable units 14, which are hand held units (Fig. 3, with receiver 38 and receiver driver 37 eliminated). At each
10 exit door 101X, there is a basket 102X where the visitors return the portable units 14 upon leaving the museum.

Reference is now made to Fig. 11, describing the operation of the system of Fig. 10. In block 110 the visitor receives his portable unit 14 at entrance door 101E. In block 111 the visitor uses operator interface 32 (Fig. 3)
15 to key-in his ID (e.g. name), and a selected list of exhibits, each identified by its location coordinates and exhibit code, as taken from the exhibition catalog or map. This information establishes the contents of registers 31 and 34 of Fig. 3, according to a simplified version of the table of Fig. 6A, where the "assignment details" and "report" columns are eliminated. Then the visitor moves into the
20 museum area, facing the first changeable sign (block 112), which is a traffic sign (blocks 113, 114). Traffic sign 15 receives a guidance signal (Fig. 6C, with the "Assignment Details" eliminated) and responds with displaying traffic directions, by matching the direction instruction (from Fig. 6C) with the target location coordinates, according to the guidance table of Fig. 6B. The visitor ID included
25 in the guidance signal, is preferably also displayed by traffic sign 15, to assure the visitor that the displayed message relates to him. The displayed traffic direction, e.g. in a form of an illuminated arrow, leads the visitor to the next changeable sign (block 112), which is either a traffic sign or a target sign (block 113). If it is a traffic sign, the procedure described above repeats; if it is a target
30 sign, at block 115 the sign with the matching target ID responds to the guidance signal (Fig. 6C) by blinking with an eye-catching light, along with the visitor ID

taken from the guidance signal of Fig. 6C. The visitor then observes the exhibit (still in block 95). If the exhibit has been the last one on the list, as indicated on the display, the visitor moves to an exit door 101X, where he returns his portable unit 14 into basket 102X. If the exhibit has not been the last one in the assignment memory (Fig. 6A), the visitor approaches the next traffic sign and the procedure described above is executed once again.

Another variation of a warehouse guidance system will be described in reference to Figs. 12-15. In this variation, there are no specific entrance or exit gates; instead, guidance and/or reporting information is communicated to and from the portable units throughout the warehouse area via a wireless communication link. This allows frequent, flexible changes of the assignments even during their execution.

Fig. 12 illustrates warehouse 120, where central computer 11 is linked to a plurality of infrared transceivers 127 deployed throughout the warehouse ceiling to communicate with all changeable target signs 126, changeable traffic signs 15 and portable units 124. Such infrared communication links are known in the art and operate commercially. Transmission is usually made by broadcasting coded signals, including address information identifying specific units. Each unit which includes an infrared receiver examines the received signal, and takes into account only messages addressed to it, according to the contents of address register 34 (Fig. 3), 48 (Figs. 4 and 8) or 51 (Figs. 5 and 13). Uploading information is made by portable units 14 (Fig. 3) by employing transmitter 36 to communicate with any of the ceiling transceivers 127 (Fig. 12).

Fig. 13 describes a preferred embodiment of the changeable target sign according to the variation of Fig. 12. It is similar to the changeable target sign 16 of Fig. 5, except that storage device 131, including assignment table information (see Fig. 14D), is added.

Fig. 14A describes the contents of the assignment memory register 31 of portable unit 14 (Fig. 3) according to the variation of Fig. 12. The

contents is a list of assignments, each identified by a target ID. This list can be downloaded or modified by central computer 11, by communication between the central computer and a selected portable unit through ceiling transceivers 127. The list contains just the target ID, and memory space is reserved for keying-in
5 report information via operator interface 32 (Fig. 3). Fig. 14B describes the contents of guidance table 41 (Figs. 4 and 8), assigning a direction ("left", "right", "ahead") from each traffic sign 15 to each active target. This information, relating only to active targets (i.e. targets which are associated with current assignments), is computed by central computer 11 and is downloaded
10 selectively to relevant traffic signs 15, according to a reasonable path of the operator; in one case all traffic signs can receive guidance signals to all active targets; in another case, to save communication time between the central computer and the traffic signs, signs which are remote from the path of the operator may be not communicated. Fig. 14C describes the contents of the
15 guidance signal transmitted continuously by portable unit 14 via transmitter 36. It includes the target ID, to be identified and responded to by traffic signs and the corresponding target sign, and the operator ID to be displayed on the responding signs, to avoid ambiguity with directions aimed at neighboring operators. Fig. 14D describes the contents of assignment table 131 (Fig. 13),
20 which has been added to this variation. This information is downloaded to the target sign by central computer 11 via ceiling transceivers 127 (Fig. 12). When an operator identifies himself by transmitting the guidance signal (Fig. 14C), the assignment details corresponding to this operator, along with a guidance signal and the operator's ID, are displayed on the changeable target sign 126.

25 Fig. 15 summarizes the operation procedure of the variation of Fig. 12. In block 150 the operator awaits near a sign. As no assignment has been downloaded yet to his portable unit, his portable unit transmits no signal and hence no response is received. In block 151 central computer has selected and computed an assignment for the operator, and accordingly transmits the
30 contents of the assignment memory 31 to the operator's portable unit 14 (Figs. 3 and 14A), the contents of guidance table 41 (Figs. 41 and 14B) to all relevant

traffic signs 15, and the contents of assignment table 131 (Figs. 13 and 14D) to the selected target sign 126. As a result, portable unit 14 starts transmitting the guidance signal (Fig. 14C). In block 152 the relevant adjacent sign responds to the guidance signal. If it is a traffic sign (block 154) the operator receives traffic
5 directions and travels accordingly to the next sign (block 153). If it is a target sign (block 155) the operator visits the target, executes his assignment according to the details displayed on the target sign, reports as appropriate, and then, according to the details of the assignment, he executes the next assignment (block 152), or completes his task (block 157).

10 Another application of interest is a parking garage, where an empty space is allocated to each car entering an entrance gate. A portable unit, preloaded with the allocated parking spot details, is handed or automatically dispensed to the driver at an entrance gate. The portable unit interacts with changeable traffic signs to produce driving directions, and then the specific,
15 preassigned parking spot is clearly identified by its changeable target sign. In this case, the communication between the portable unit and the preassigned target sign confirms that the driver has reached his parking space, which is preferably recorded in the assignment memory (Fig. 6A or 7A) as report information, and reported at an exit gate (where the portable unit is also
20 returned) for control purpose.

Another variation of interest relates to a warehouse divided into zones, each zone served by an operator. The portable unit is attached to a cart or a box which accommodates the picked items, thus a pick assignment may be
25 executed by several operators, each moving and loading the cart or box in his turn. As the cart or box is moved and loaded by a zone's operator, the attached portable unit communicates with and triggers the changeable signs in its vicinity in accord to the respective assignment. At the border between two zones, the cart or box, along with the attached portable unit, is left to be moved and loaded
30 by the adjacent zone's operator, and so on, until the assignment is completed.

In still another variation of interest, portable unit 14 (Fig. 3) also includes a display screen controlled by portable unit's controller 30. When communicating with changeable traffic sign 15 or changeable target sign 16, at least part of the information to be displayed on these changeable signs may be
5 displayed on the portable unit's display, instead of or in addition to being displayed on the sign. This may aid the operator in reading and distinguishing the information relating to him, and even allow eliminating the display 22 on changeable traffic sign 4 (which actually converts it to a guidance transponder instead of a sign,) or eliminating the screen 24D of the changeable target sign
10 16, while leaving the light 24L on the sign for better identification of the target.

While the preferred embodiments described above relate principally to warehouse and museum applications, it would be appreciated that the guidance system of the present invention is useful in many other
15 applications.

WHAT IS CLAIMED IS:

1. A guidance system for guiding a user to selected targets among a plurality of
5 targets located within a defined area, comprising:

a portable unit to be carried by the user, including a memory for storing
target information identifying a selected target within said defined area, and a
transmitter for transmitting signals identifying the selected target within said
defined area;

- 10 and at least one changeable guidance sign at a predetermined location
within said defined area, said changeable guidance sign including a receiver for
receiving signals transmitted by said portable unit, a memory for storing guidance
information relating the locations of said plurality of targets with respect to said
predetermined location of the changeable guidance sign, and a display for
15 displaying the stored guidance information of the location of a target
corresponding to a signal transmitted from said portable unit and received by the
changeable guidance sign.

2. The system according to Claim 1, wherein there are a plurality of said
changeable guidance signs each at one of a plurality of predetermined locations
20 within said defined area.

3. The system according to Claim 1, wherein said portable unit memory
stores information identifying a plurality of targets to be visited in sequence, and
said transmitter transmits signals identifying the respective selected target to be
visited in the sequence.

4. The system according to Claim 1, wherein said system further comprises a plurality of target devices, one at each of said target locations, each of said target devices including a receiver for receiving target signals transmitted by said portable unit, and a target indicator for indicating that a received target
5 signal identifies the respective target.

5. The system according to Claim 4, wherein each of said portable units also transmits its identification to each of the target devices, and each of said target devices also displays the identification of the respective portable unit transmitting a signal received by the target device.

10 6. The system according to Claim 4, wherein each of said target devices is a changeable sign displaying information which changes in response to the target signal received thereby.

7. The system according to Claim 1, wherein there are a plurality of said portable units, each to be carried by one of a plurality of users of the guidance
15 system, and wherein each of said portable units transmits its identification to the changeable guidance sign, and said changeable guidance sign also displays the identification of the respective portable unit transmitting a signal received by the changeable guidance sign.

8. The system according to Claim 7, wherein said changeable guidance
20 sign display includes a plurality of display devices for simultaneously displaying guidance information of the locations of a plurality of targets for a plurality of portable units, and the identification of the respective portable unit.

9. The system according to Claim 7, wherein the system further comprises a computer for storing said target data identifying the targets within said defined area, and for communicating with said portable units to download into their respective memories the target information identifying selected targets
5 within said defined area.

10. A guidance system for guiding a user to selected targets among a plurality of targets located within a defined area, comprising:
a portable unit to be carried by the user, including a memory for storing target information identifying a selected target within said defined area, and a transmitter
10 for transmitting signals identifying the selected target within said defined area;

a plurality of target devices, one at each of said target locations, each of said target devices including a receiver for receiving target signals transmitted by said portable unit, and a target indicator for indicating that a received target signal identifies the respective target;

15 and a computer for storing said target data identifying the targets within said defined area, and for communicating with said portable unit to download into their respective memories the target information identifying selected targets within said defined area.

11. The system according to either of Claims 9 or 10, wherein the
20 system further comprises a check-in unit linked to said computer for communicating with said portable units to download into their respective memories the target information identifying selected targets within said defined area.

12. The system according to Claim 11, wherein said check-in unit
downloads into the memory of each portable unit a plurality of selected targets
within said defined area to which the user carrying the portable unit is to be
sequentially guided, and wherein said portable units include a manual input
5 device to sequentially select each of said plurality of targets.

13. The system according to either of Claims 9 or 10, wherein said
system further comprises wireless communication links enabling said computer to
communicate with said portable units to download into their respective memories
the target information identifying the selected targets within said defined area.

10 14. The system according to Claim 10, wherein said computer also
stores assignment information specifying a task to be performed by the user at a
respective target location, which assignment information is also downloaded into
the memories of the portable units with the respective target locations.

15 15. The system according to Claim 14, wherein said assignment
information is also displayed in the respective portable unit.

16. The system according to Claim 14, wherein said assignment
information is also transmitted by the portable units and is received and displayed
by the respective target devices.

17. The system according to Claim 14, wherein each of said portable
20 units includes a manual input device for manually inputting report information
relating to the task specified to be performed by said assignment information.

18. The system according to Claim 1, wherein said defined area is a
warehouse for storing a large number of articles at a plurality of locations, each

location representing a target location to which the user carrying a portable unit is to be guided.

19. The system according to Claim 1, wherein said defined area is a museum having a large number of exhibits at a plurality of locations, each location
5 representing a target location to which the user carrying a portable unit is to be guided.

20. The system according to Claim 1, wherein said defined area is a parking garage having a large number of parking spaces at a plurality of locations, each location representing a target location to which a user carrying a portable
10 unit is to be guided.

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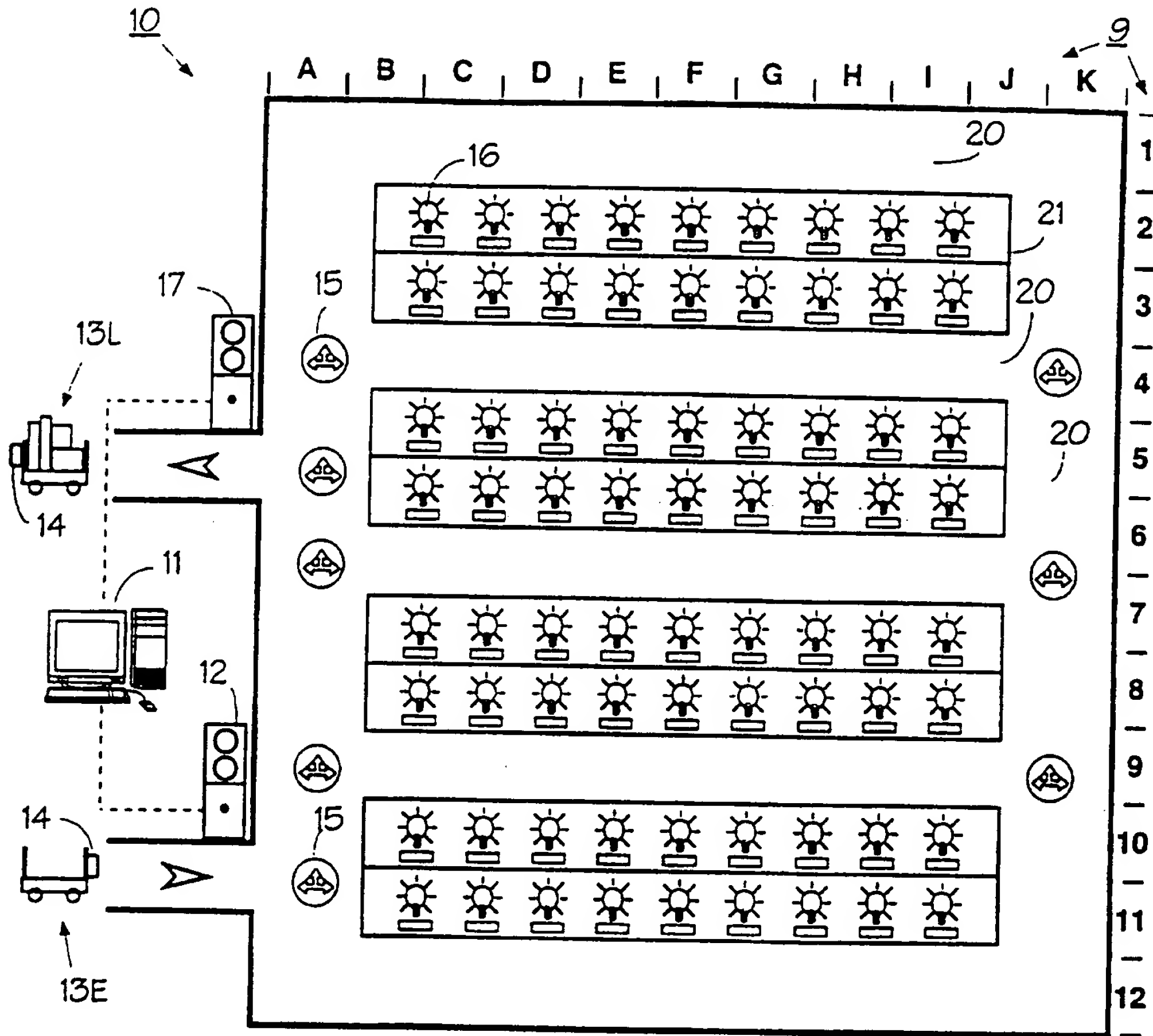


FIG. 1

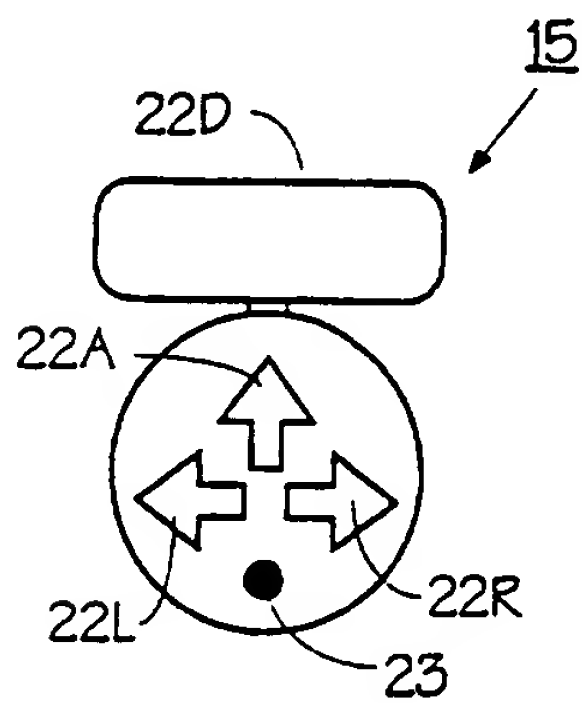


FIG. 2A

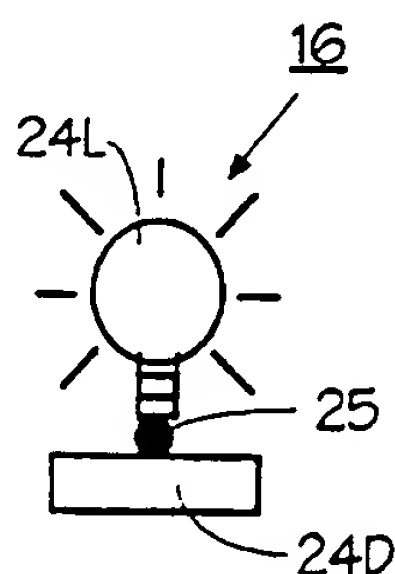


FIG. 2B

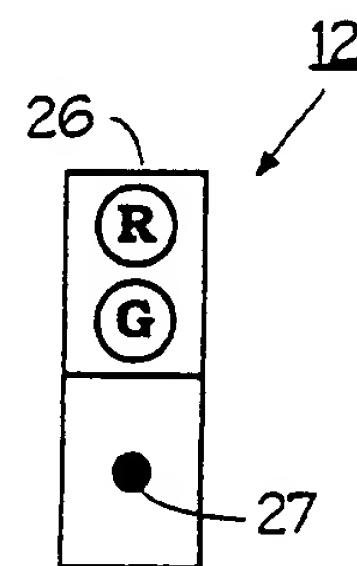


FIG. 2C

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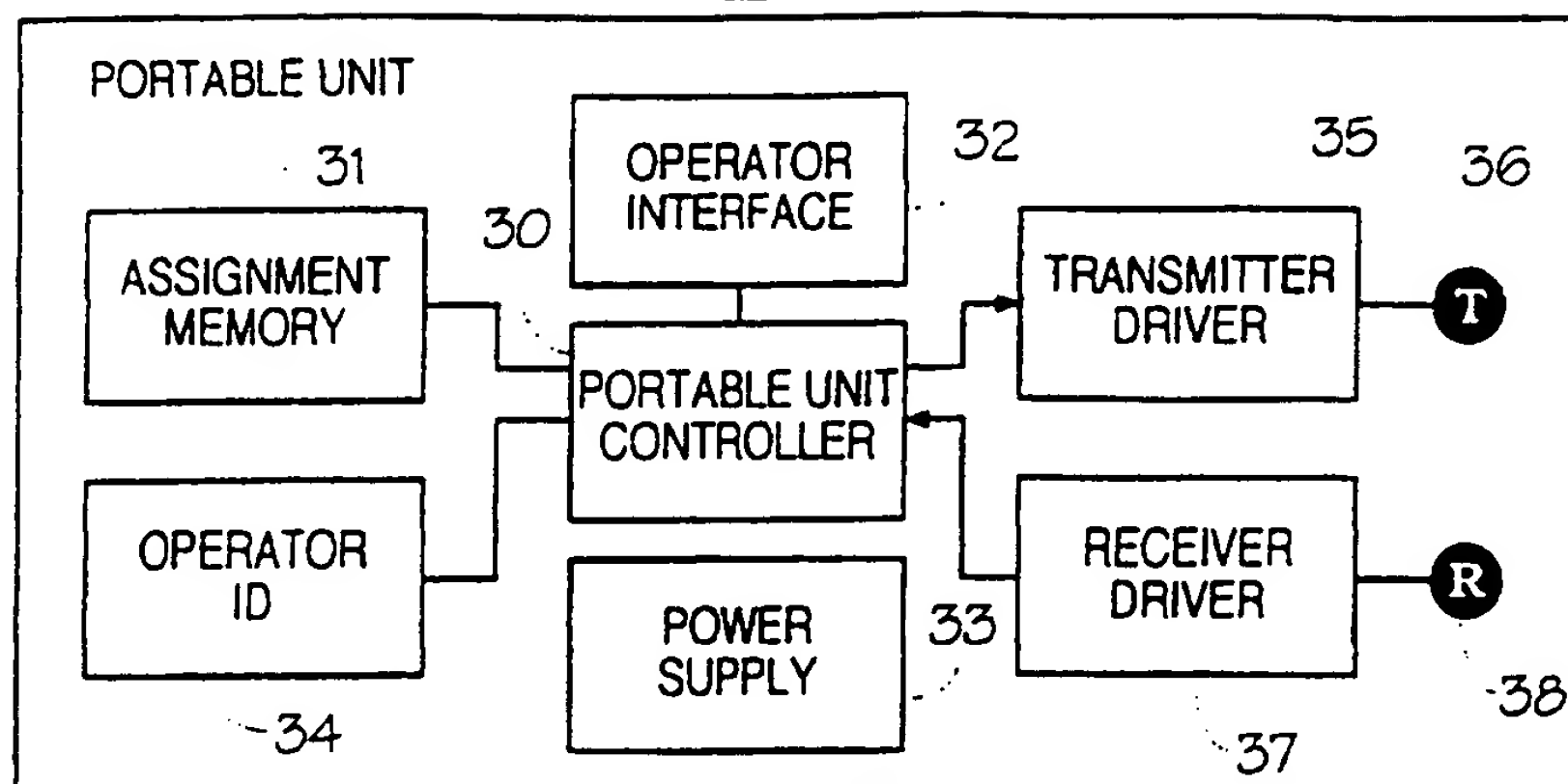


FIG. 3

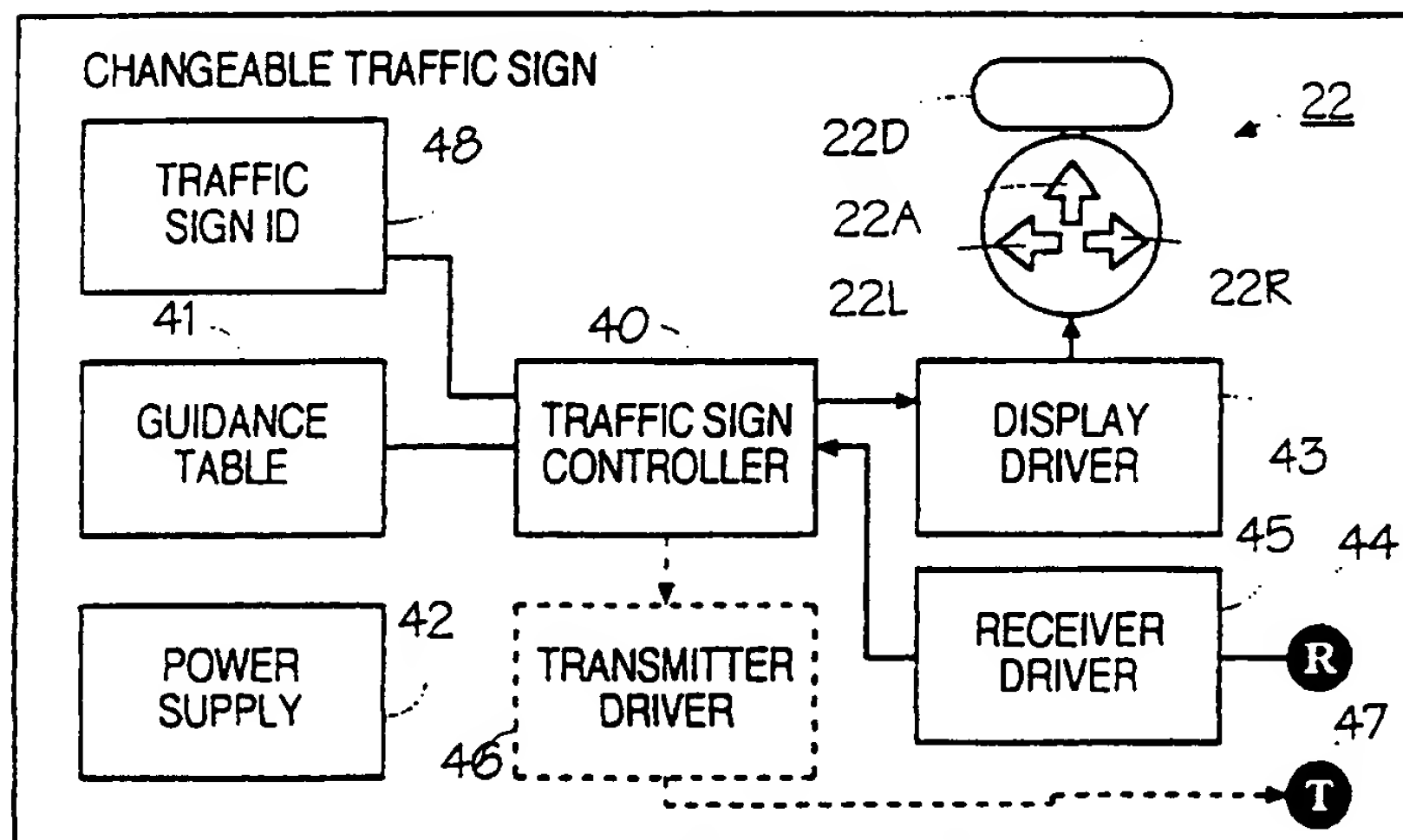


FIG. 4

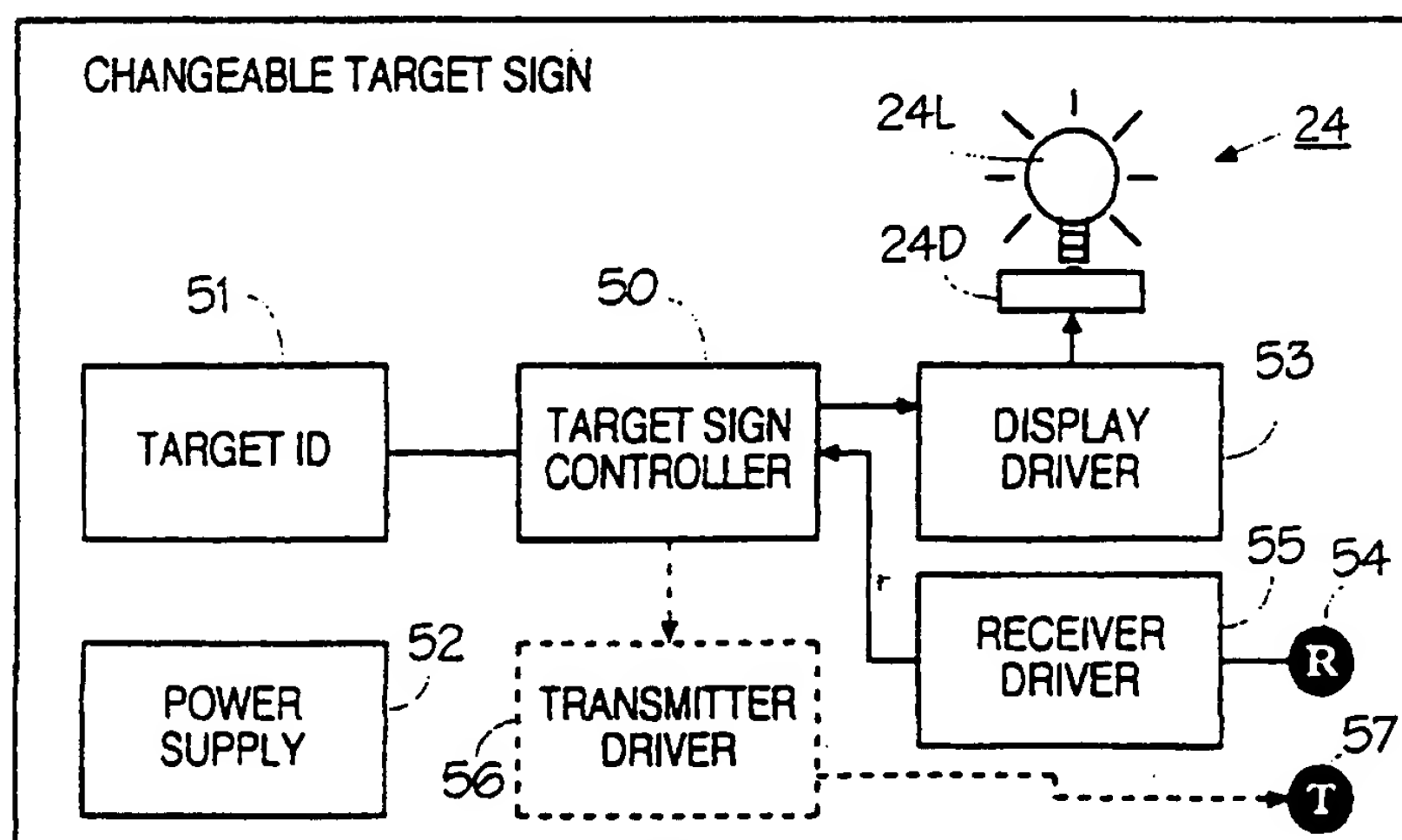


FIG. 5

ASSIGNMENT MEMORY

	<u>TARGET LOCATION</u>	<u>TARGET ID</u>	<u>ASSIGNMENT DETAILS</u>	<u>REPORT</u>
1.	E6	1234	PICK 4 BOXES	[_____]
2.	H3	4321	PICK 2 UNITS	[_____]
3.	D1	3412	PICK 2 UNITS & EXIT	[_____]

FIG. 6A

GUIDANCE TABLE

<u>LOCATION</u>	<u>DIRECTION</u>
A1	LEFT
A2	LEFT
...	...

FIG. 6B

GUIDANCE SIGNAL

[TARGET LOCATION]
[TARGET ID]
[ASSIGNMENT DETAILS]
[OPERATOR ID]

FIG. 6C

ASSIGNMENT MEMORY

	<u>ROUTE DIRECTIONS</u>	<u>TARGET ID</u>	<u>ASSIGNMENT DETAILS</u>	<u>REPORT</u>
1.	1-L; 3-R; 6-A; 8-R;	1234	PICK 4 BOXES	[_____]
2.	10-L; 14-L; 15-R;	4321	PICK 2 UNITS	[_____]
3.	21-R; 22-L;	3412	PICK 2 UNITS & EXIT	[_____]

FIG. 7A

GUIDANCE TABLE

SIGN#=12

FIG. 7B

GUIDANCE SIGNAL

[OPERATOR ID]
["SIGN#-DIRECTION" OR
"TARGET ID-ASSIGNMENT"]

FIG. 7C

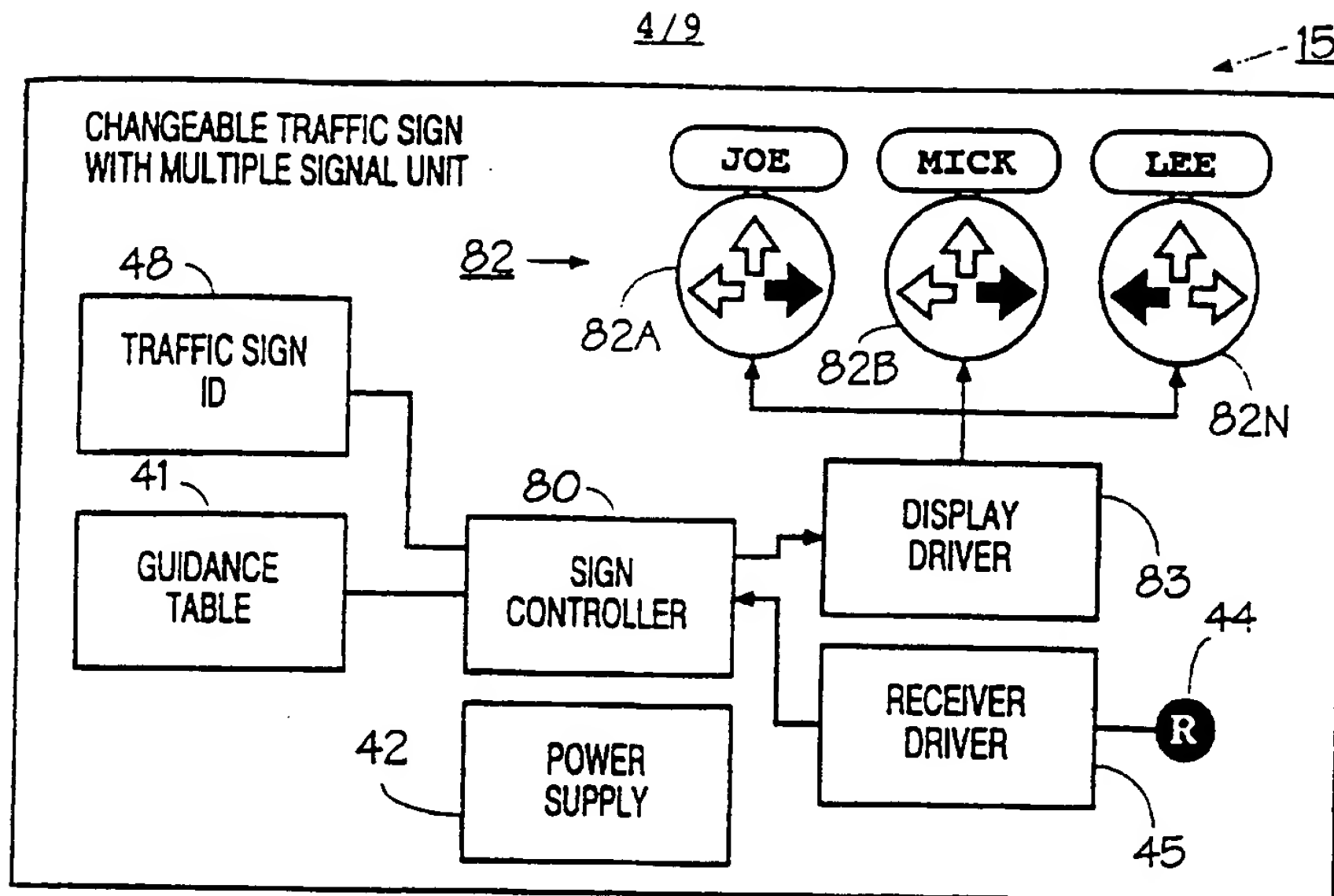


FIG. 8

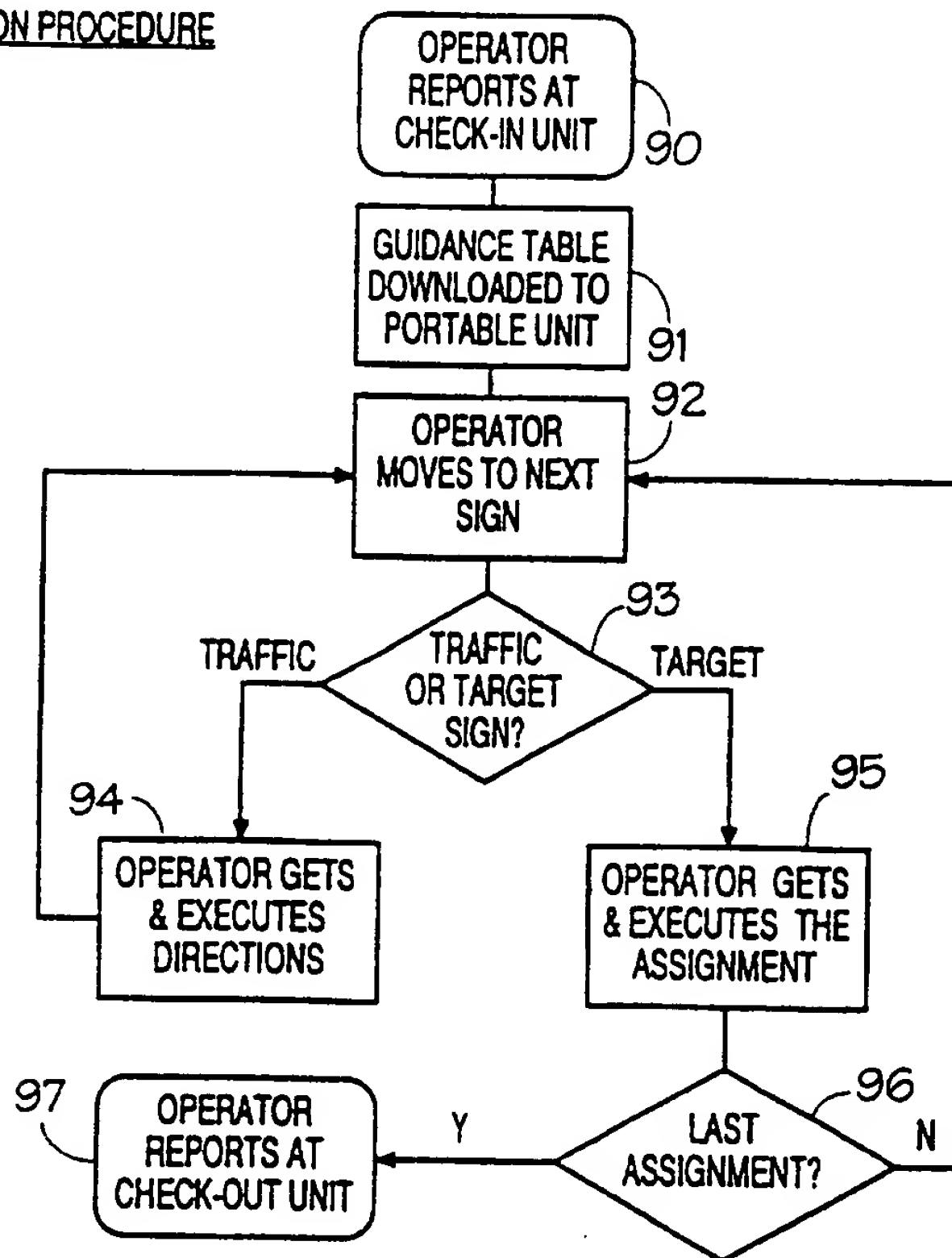
OPERATION PROCEDURE

FIG. 9

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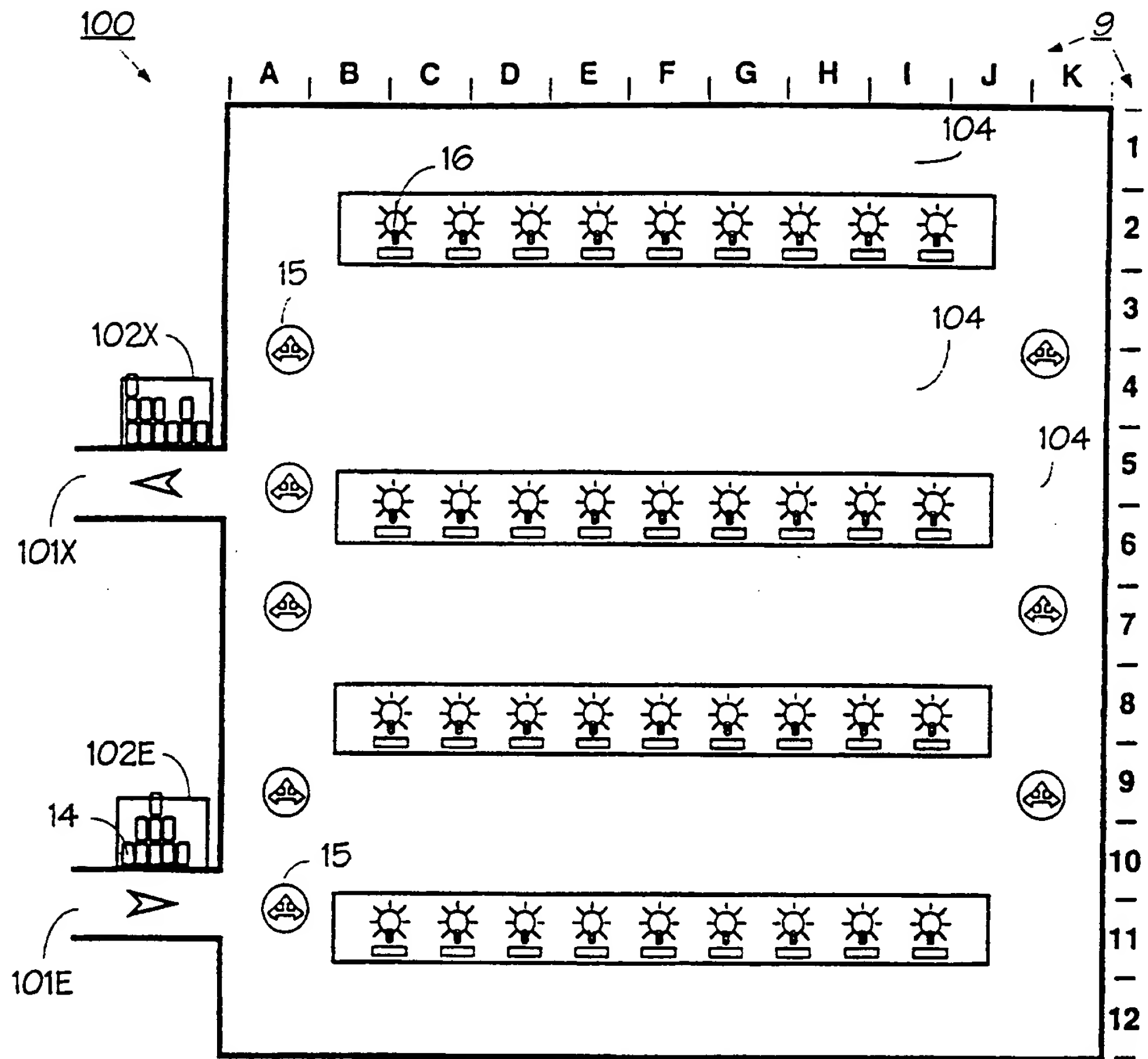
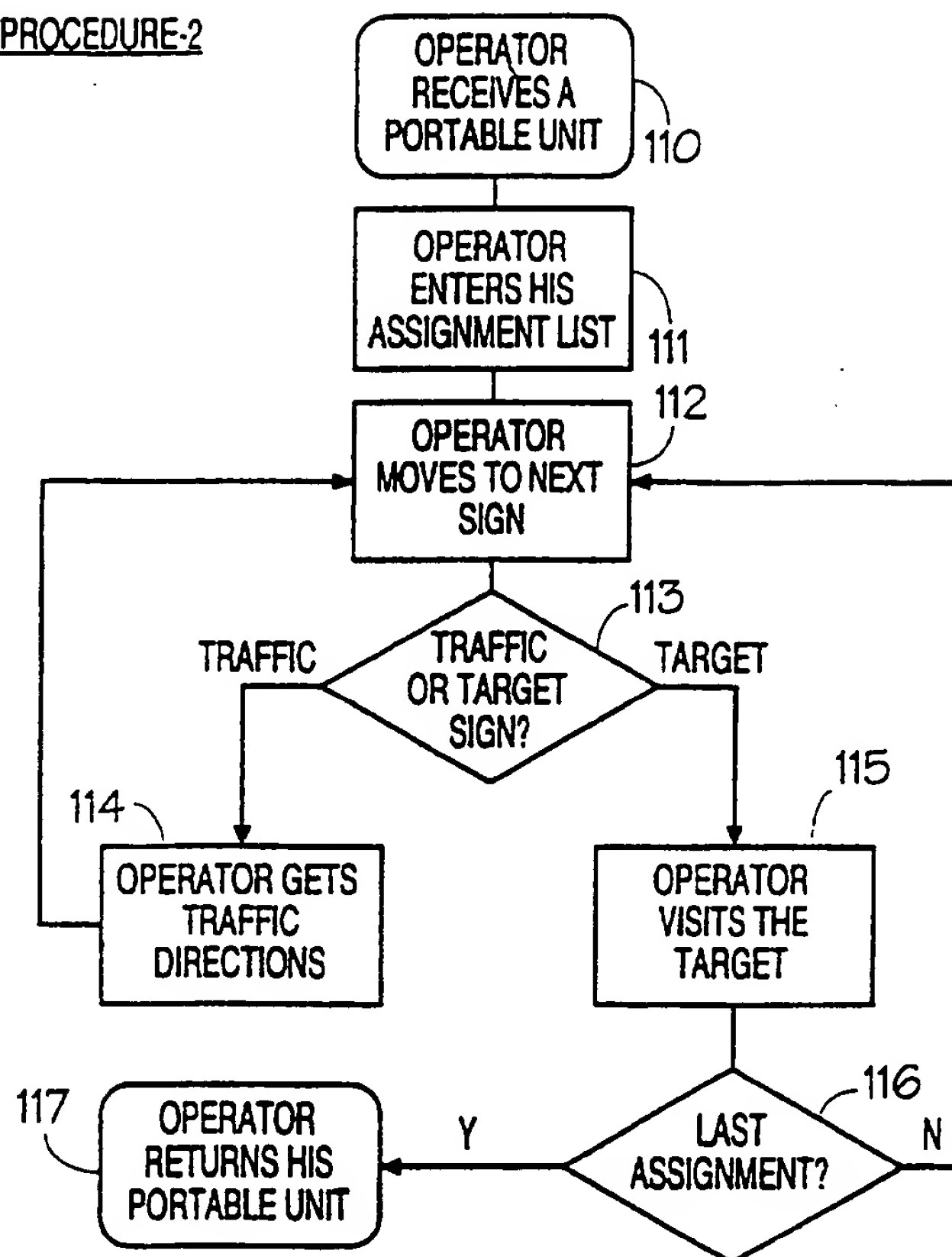


FIG. 10

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OPERATION PROCEDURE-2**FIG. 11**

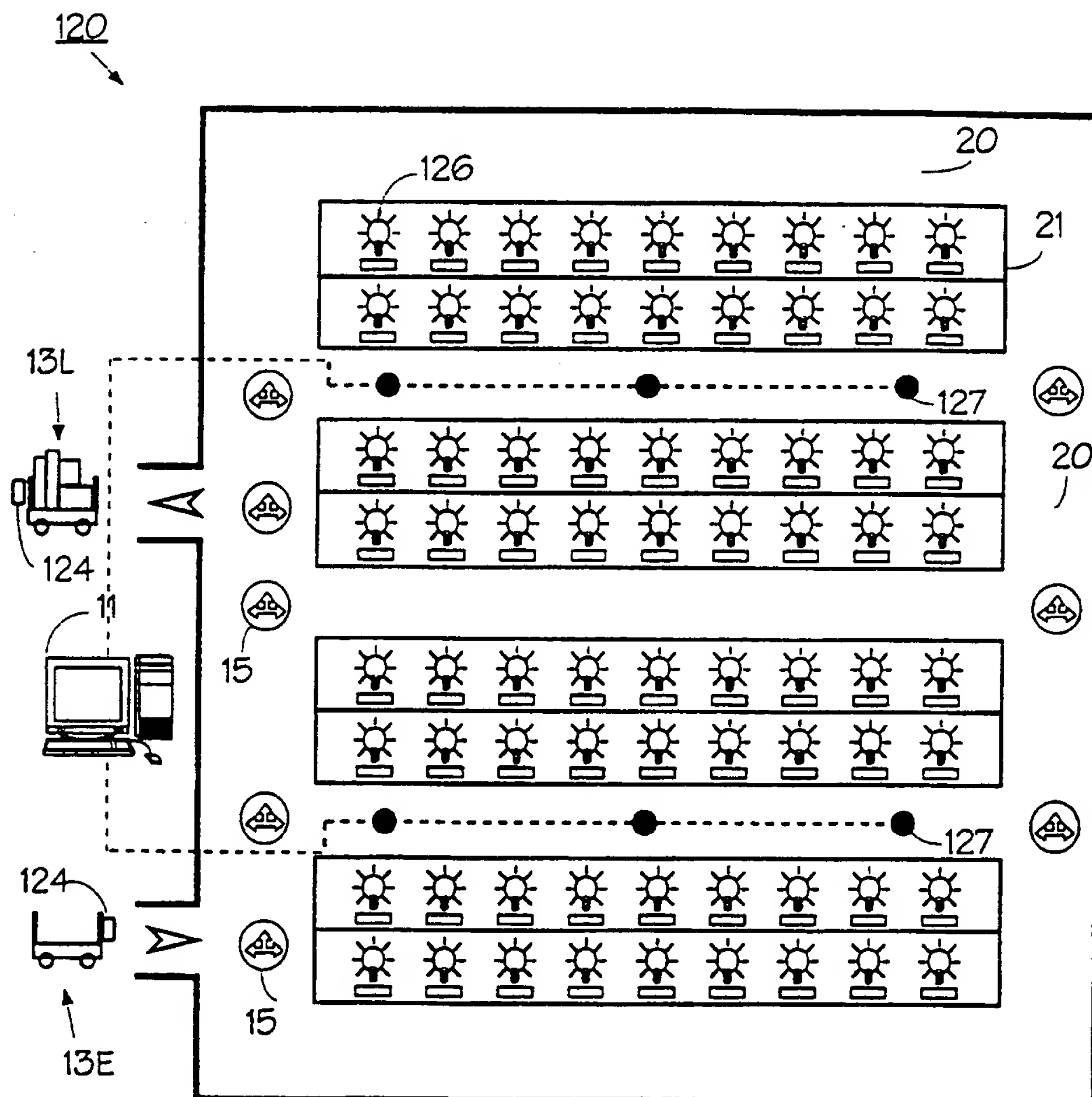


FIG. 12

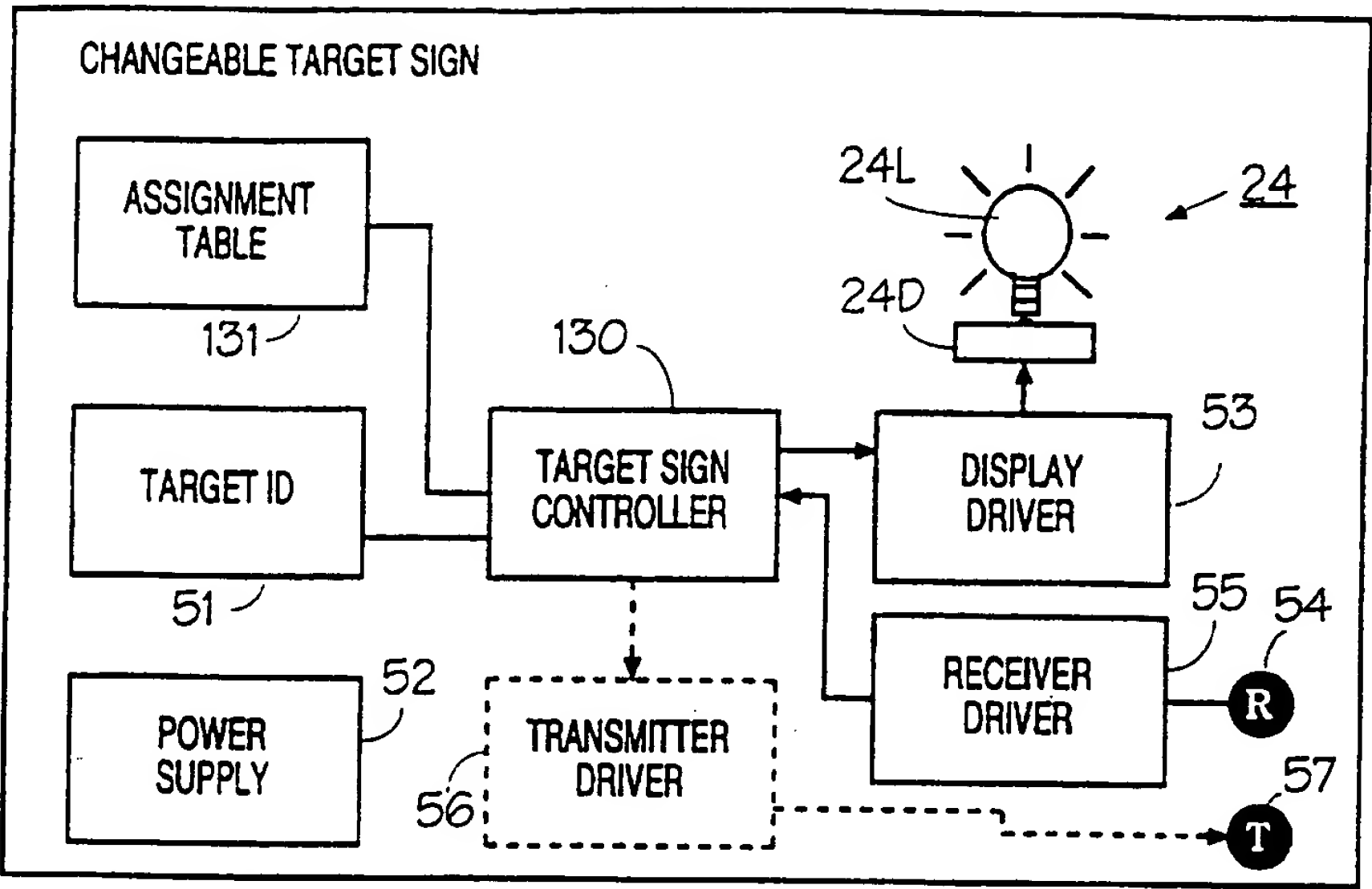


FIG. 13

ASSIGNMENT MEMORY

	TARGET ID	REPORT
1.	1234	[_____]
2.	4321	[_____]
3.	3412	[_____]

FIG. 14A

GUIDANCE TABLE

TARGET ID	DIRECTION
1234	LEFT
4321	LEFT
...	...

FIG. 14B

GUIDANCE SIGNAL

[TARGET ID]
[OPERATOR ID]

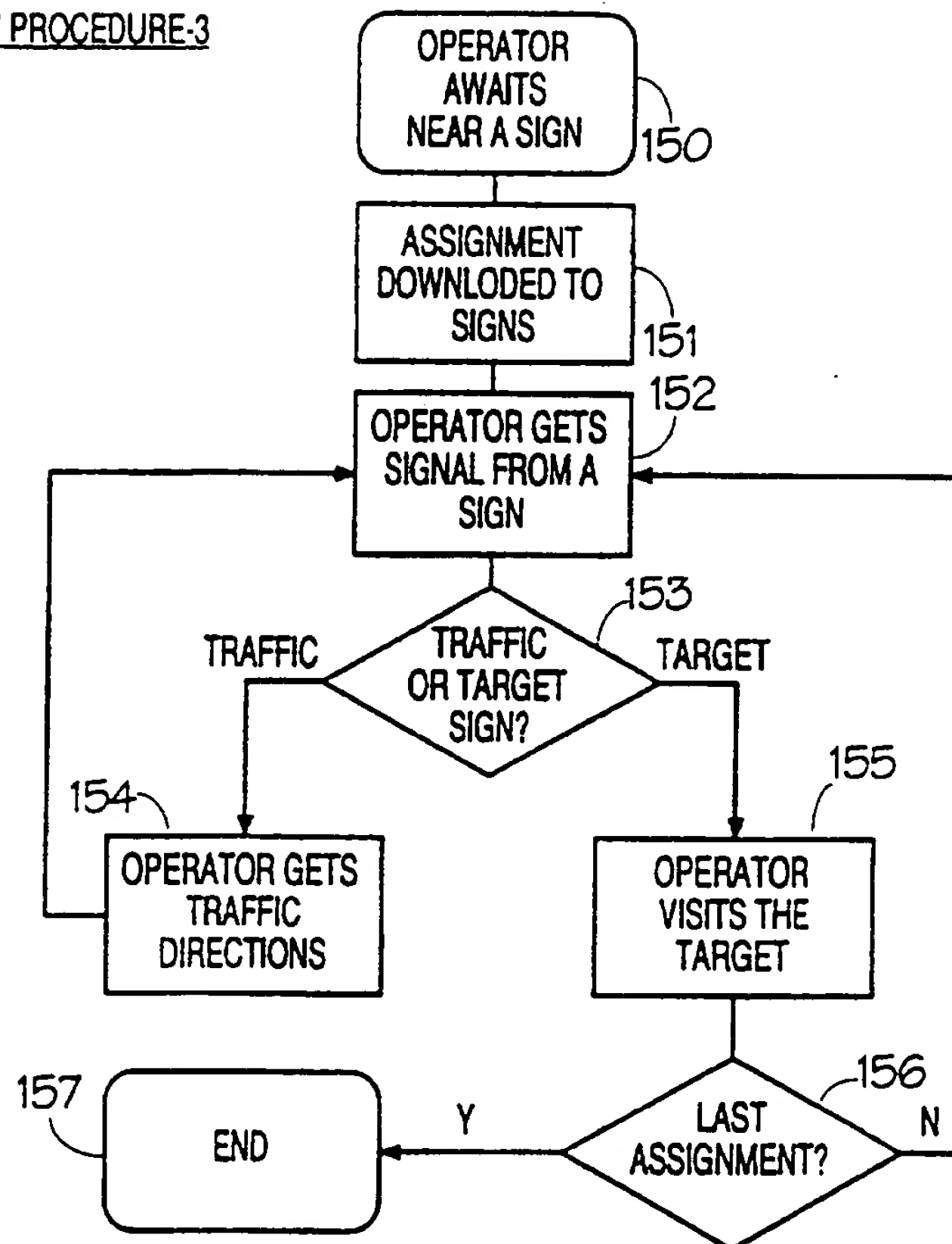
FIG. 14C

ASSIGNMENT TABLE

	OPERATOR ID	ASSIGNMENT DETAILS
1.	ABE	PICK 4 BOXES
2.	HARRY	PICK 2 UNITS
3.	JIM	PICK 2 UNITS & EXIT

FIG. 14D

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OPERATION PROCEDURE-3**FIG. 15**



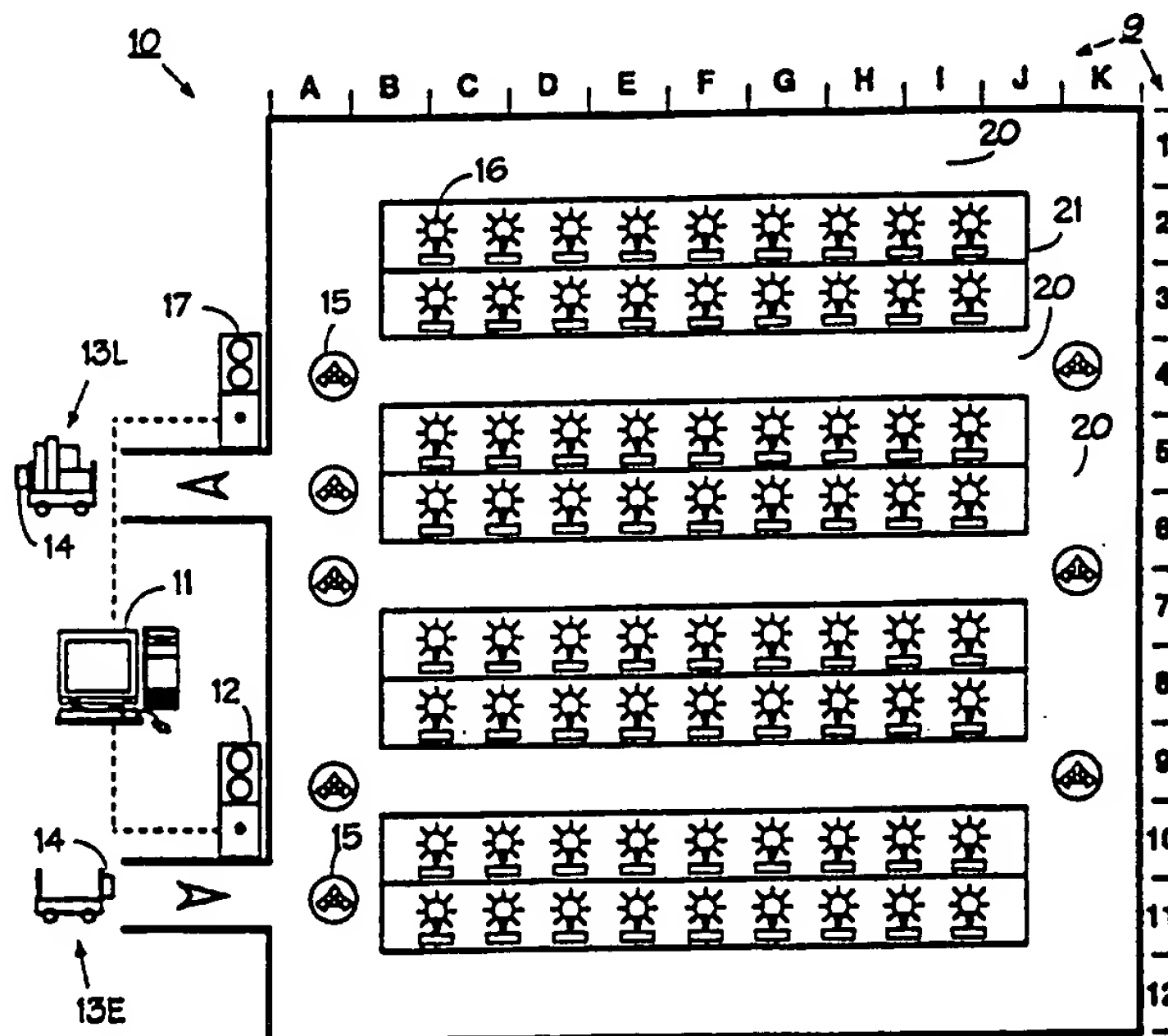
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G08G 1/005, 1/0968, 1/123, G06F 165/00		A3	(11) International Publication Number: WO 98/00819
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(21) International Application Number: PCT/IL97/00192 (22) International Filing Date: 15 June 1997 (15.06.97) (30) Priority Data: 118686 19 June 1996 (19.06.96) IL (71) Applicant (for all designated States except US): ELDAT COMMUNICATION LTD. [IL/IL]; 10 Hakishon Street, 51203 Bnei Brak (IL). (72) Inventors; and (75) Inventors/Applicants (for US only): TEICHER, Mordechai [IL/IL]; 9 Gordon Street, 44260 Kfar Saba (IL). HALPERIN, Avner [IL/IL]; 9 Wilson Street, 61141 Tel Aviv (IL). (74) Agent: A. TALLY EITAN - ZEEV PEARL, D. LATZER & CO.; Law Offices, Lumir House, 22 Maskit Street, 46733 Herzlia (IL).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. (88) Date of publication of the international search report: 25 June 1998 (25.06.98)	

(54) Title: GUIDANCE SYSTEM USING CHANGEABLE SIGNS

(57) Abstract

A guidance system for guiding a user to selected targets located within a defined area (10), such as a warehouse, museum, parking garage, etc., includes a portable unit (14) to be carried by each user and having a memory (31) for storing target information identifying a selected target within the defined area (10), and a transmitter (35) for transmitting signals identifying the selected target within the defined area (10). The system further includes at least one changeable guidance sign (15) at a predetermined location within the defined area (10) for receiving signals transmitted by a portable unit (14) and for displaying stored guidance information of the location of a target corresponding to a signal transmitted from the portable unit (14), and/or a plurality of target devices (16) at the target location for receiving target signals transmitted by a portable unit (14) and for indicating that a receiving target signal identifies the respective target.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL97/00192

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G08G 1/005, 1/0968, 1/123; G06F 165/00

US CL :Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 701/200, 201, 207, 208, 300, 24, 25; 340/988, 989, 991, 992, 904, 435, 935,825.36,825.49; 342/457, 463, 465

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: navigation, guidance, warehouse, factory, location, position, sign, direction

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,750,151 A (BAUS) 07 June 1988, entire patent	1-20
Y	US 5,387,993 A (HELLER et al) 07 February 1995, entire patent	1-20
Y	US 5,206,811 A (ITOH et al) 27 April 1993, entire patent	1-20
A	US 3,908,800 A (DRAPEAU) 30 September 1975, entire patent	1-20
A	US 3,662,267 A (REED) 09 May 1972, entire patent	1-20



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See patent family annex.

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Date of the actual completion of the international search

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A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

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